



Report and Recommendation of the President to the Board of Directors

Project Number: 32124
June 2006

Proposed Supplementary Loans Papua New Guinea: Road Maintenance and Upgrading (Sector) Project

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 31 May 2006)

Currency Unit	–	kina (K)
K1.00	=	\$0.325
\$1.00	=	K3.076

ABBREVIATIONS

ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
CSP	–	country strategy and program
DEC	–	Department of Environment and Conservation
DOT	–	Department of Transport
DOW	–	Department of Works
EA	–	executing agency
EMMP	–	environmental management and monitoring plans
GDP	–	gross domestic product
HRMG	–	Highlands Region Maintenance Group
ICB	–	international competitive bidding
IEE	–	initial environmental examination
IRI	–	International Roughness Index
km	–	kilometer
masl	–	meters above sea level
MTDS	–	Medium-Term Development Strategy
NCB	–	national competitive bidding
NRA	–	National Road Authority
OCR	–	ordinary capital resources
PIU	–	project implementation unit
PNG	–	Papua New Guinea
PPR	–	project performance report
PPTA	–	project preparatory technical assistance
PSC	–	project steering committee
QA	–	quality assurance
RAMS	–	road asset management system
RRP	–	report and recommendation of the President
RoW	–	right of way
SDR	–	special drawing rights
STI	–	sexually transmitted infection
SIEE	–	summary initial environmental examination
VOC	–	vehicle operating cost

NOTES

- (i) The fiscal year of the Government coincides with the calendar year.
- (ii) In this report, "\$" refers to US dollars

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LOAN AND PROJECT SUMMARY

Borrower	Papua New Guinea
Classification	Targeting classification: General intervention Sector: Transport and communications Subsector: Roads and highways Themes: Sustainable economic growth, inclusive social development, capacity development Subthemes: Fostering physical infrastructure development, developing rural areas, organizational development
Environment Assessment	Category B. Environmental assessment was undertaken for all 11 proposed road sections, and a summary initial environmental examination is provided in Appendix 10.
Project Description	The supplementary financial assistance will finance additional road upgrading and rehabilitation subprojects with a length of 270 kilometers (km) in the five Highlands provinces and related consulting services for project implementation and training, design, construction supervision, and project performance monitoring and evaluation.
Rationale	<p>Justifying the supplementary financial assistance are four main points</p> <ul style="list-style-type: none">(i) The proceeds of Road Maintenance and Upgrading (Sector) Project (Loan 1709-PNG) have been fully committed and are able to finance only 50.4% of the total length of roads targeted in the original project scope. The additional proposed subprojects to be financed by supplementary financial assistance will enable achievement of 91% of the originally targeted road length.(ii) The proposed supplementary financial assistance is in line with the Government's development strategy, which continues to emphasize improving transport infrastructure.(iii) Supplementary financing is consistent with the Asian Development Bank (ADB) country strategy for Papua New Guinea (PNG).(iv) Supplementary financial assistance will save substantial project start-up cost and is the most efficient and effective way to improve road infrastructure in the Highlands.

Using Asian Development Fund (ADF) financing is justified by ADB's country classification and PNG's social and economic status. PNG is an ADB category B2 country whose limited debt repayment capacity entitles it to limited ADF financing.

A recent assessment found that the incidence of poverty in PNG increased from 37.5% of the population in 1996 to 54% in 2003.

The Highlands are home to the highest proportion of the poor. The region is mountainous and geologically unstable, with torrential rains that can last 6 or 7 months. Road construction and maintenance are costly, requiring concessional funding.

Impact and Outcome

The proposed road subprojects for supplementary financing are in line with the impact and outcome of the Project as approved by ADB. It aims to scale up the Project's impact on PNG economic development and social integration by financing more road sections to (i) improve road access for the private businesses and communities, (ii) reduce their travel costs and time to major commercial and service centers, and (iii) enable them to tap economic and social opportunities in the Highlands. It will contribute to (i) export-led economic growth, (ii) income generation for local communities, and (iii) poverty reduction. The outcome will be improved rural access to market centers.

Cost Estimates

The total cost of the proposed road subprojects, including civil works, consulting services, contingencies, taxes and duties, interest during construction, and other financial charges, is estimated at \$78.07 million equivalent.

Financing Plan

The Government has requested ADB to provide a blend of two loans for a total of \$53 million, consisting of \$35 million from ordinary capital resources (OCR) and \$18 million from ADF. ADB will finance 68% of the total cost of the additional road subprojects, and the Government will provide \$25.07 million equivalent to cover the remaining cost.

Financing Plan
(\$ million)

Source	Total	Percent
Asian Development Bank		
OCR	35.00	45
ADF	18.00	23
Government	25.07	32
Total	78.07	100

ADF = Asian Development Fund, OCR = ordinary capital resources.

Source: ADB estimates.

Loan Amounts and Terms

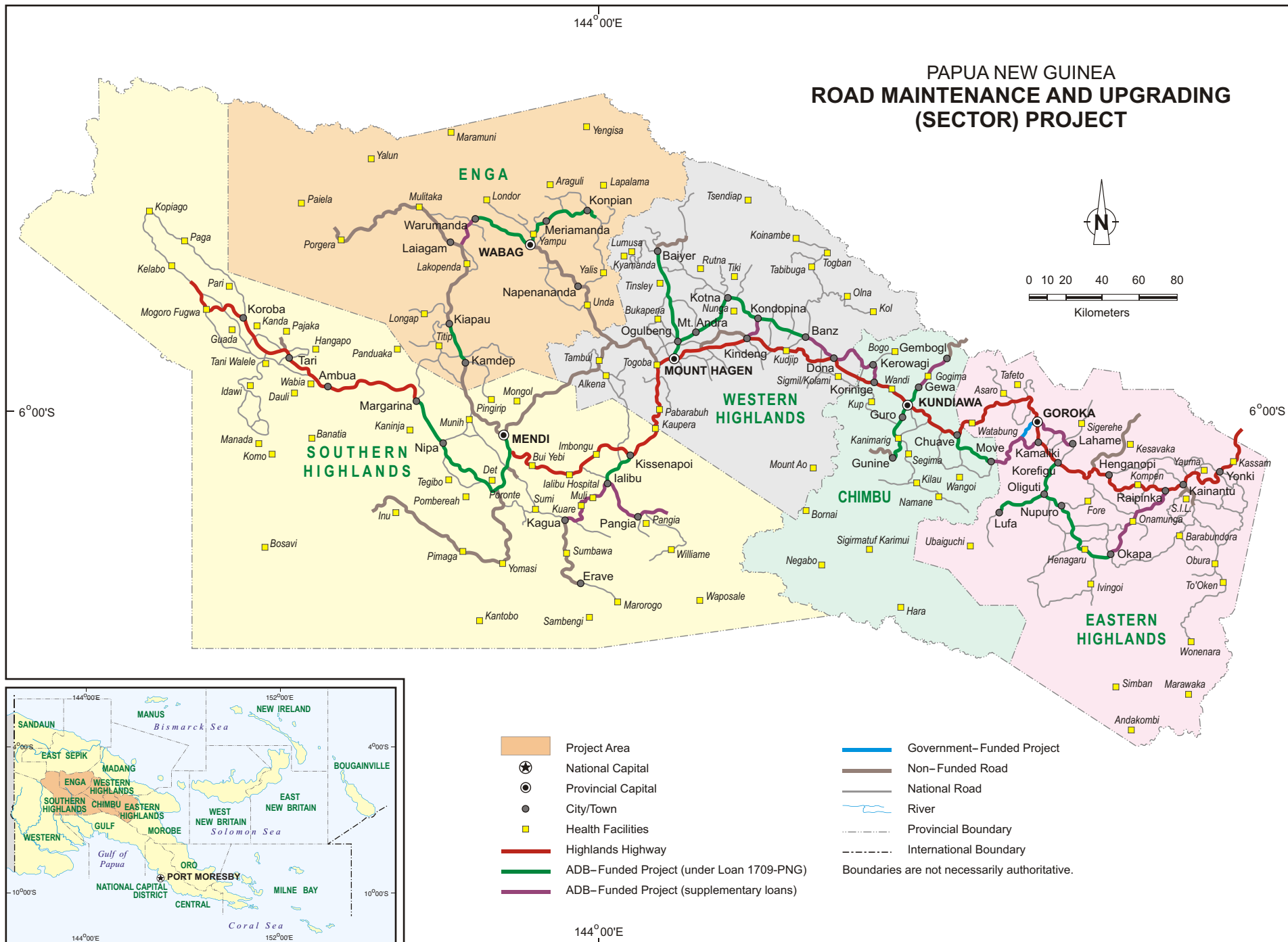
The two loans totaling \$53 million consist of an OCR loan of \$35 million and an ADF loan of \$18 million. The OCR loan will carry a term of 24 years, with a grace period of 4 years, an interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility, and a commitment charge of 0.75% per annum. The ADF loan will have a maturity of 32 years, including a grace period of 8 years, an interest charge of 1% per annum during the grace period and 1.5% per annum thereafter, and equal amortization.

Period of Utilization

Until 30 June 2010

Estimated Project Completion Date	31 December 2009
Executing Agency Implementation Arrangements	The Department of Works (DOW) will continue as the Executing Agency, and the Highlands Region Maintenance Group (HRMG) as the Project Implementation Unit (PIU). The project steering committee will continue to ensure close interagency coordination and monitor project implementation.
Procurement	Procurement of civil works under supplementary financing will follow ADB's <i>Procurement Guidelines</i> . Civil works will be divided into 16 contract packages, five of them procured under national competitive bidding without excluding foreign contractors and joint ventures, and 11 procured under international competitive bidding.
Consulting Services	International consultants will be recruited pursuant to ADB's <i>Guidelines on the Use of Consultants</i> to assist in (i) detailed engineering design; (ii) preconstruction activities; (iii) construction supervision; (iv) project performance monitoring and evaluation; and (v) training on road maintenance, road safety, and prevention of HIV/AIDS and other sexually transmitted infections (STIs). The Government will recruit and finance local consultants for (i) project design; (ii) construction supervision; (iii) financial auditing; and (iv) training on road maintenance, road safety, and STI/HIV/AIDS prevention.
Project Benefits and Beneficiaries	The proposed subprojects for supplementary financing will generate substantial economic benefits. Using a 12% discount rate, the net present value is \$56.89 million, and the economic rate of return is 18.8%. The proposed subprojects are feeder roads servicing a population of about 600,000. They will contribute to poverty alleviation in the Highlands by (i) providing job opportunities, (ii) increasing farmers' income from cash crops, and (iii) facilitating access to social services. It is estimated that 1,500 local employment opportunities will be directly generated by implementing the proposed subprojects, and an additional 6,000 job opportunities will be created through the maintenance program for the roads completed under the Project.
Risks and Assumptions	The subprojects to be financed under the Project are subject to the usual risks for road sector projects, including project start-up delay, road sustainability, environmental impact, and STI/HIV/AIDS exposure. The design of the Project takes into account these risks and includes mitigating measures. To minimize project start-up delay, all 11 road subprojects have already been screened, and due diligence has been completed. The existing implementation arrangement, including consulting services for project implementation, will be maintained to ensure continuity and avoid disruption. Procurement of civil works will follow a single-stage one-envelope bidding procedure with post-qualification to expedite the process. HRMG will implement a

contracting-out system to engage local communities or contractors to provide routine and periodic maintenance for completed ADB-financed roads and ensure better financial sustainability. An assurance is included to ensure that the Government will maintain the completed road sections funded by the Project. Environmental impacts during construction will be mitigated by DOW's implementing the environmental management and monitoring plans. The monitoring results will be reflected in the project progress reports. The STI/HIV/AIDS impact will be mitigated by incorporating appropriate conditions in civil works contracts that require contractors to adopt preventive measures, supplemented by training and awareness campaigns financed by the Project. Prevention activities undertaken under each road section will be monitored and reflected in the project progress reports to be submitted to the National AIDS Council and the Country Coordinating Mechanism.



I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on proposed supplementary loans to Papua New Guinea (PNG) for the Road Maintenance and Upgrading (Sector) Project (the Project).¹

II. THE APPROVED PROJECT

A. Project Rationale

2. An Asian Development Bank (ADB) report and recommendation of the President (RRP) to the Board of Directors, approved in November 1999², provided a description and rationale for the Project. From independence to the early 1990s, PNG's economy was driven by exports. The primary production area was the Highlands, comprising the provinces of Eastern Highlands, Enga, Chimbu, Southern Highlands, and Western Highlands. The region was geographically and culturally diverse, with a population of about 2 million, almost half of PNG's total. In spite of the rich natural resources, the region's population was predominantly poor, living by subsistence farming and other basic livelihoods and characterized by the poorest health, education, and social indicators in the country.

3. The transport system of PNG was multimodal, comprising about 27,000 kilometers (km) of roads; 22 ports; countless wharves, jetties, and landings; 46 airports; and hundreds of airstrips. The road system in the Highlands region consisting of 600 kilometer (km) Highlands Highway linking the five provinces, and feeder roads of about 2,000 km, constituted the backbone of the Highlands and the country's economy. Road conditions were generally poor due to low design standards and lack of maintenance. Almost all unpaved roads had rough riding surfaces, with conditions ranging from rough and stony to impassable. Much of the paved road network was potholed, and in some areas the road course had reverted to gravel. Vehicles had very high operating costs and lasted only 2–4 years. Travel distances were extensive, and travel times were long. As a result, local communities (about 1 million people in this region lived within a day's walk of a road) became increasingly isolated. Significant export and business opportunities were lost. This situation led to increased social unrest and deteriorating peace and security conditions.

4. The Government realized that poor road infrastructure was a major constraint to economic growth and social development in PNG and identified the maintenance of the road network as a development priority. The national transport infrastructure plan (1992) aimed to provide (i) access to markets for farmers and mineral and industrial producers at lower transport costs, and (ii) access for communities to basic social services, including health, education, and government services. The Blueprint on Capital Works 1994–2003 of the Department of Transport and Civil Aviation provided an infrastructure investment plan and the national road restoration and construction program. The program targeted upgrading 935 km of roads and rehabilitating 776 km to (i) promote exports and agricultural production, (ii) improve social service delivery, and (iii) generate employment opportunities.

5. ADB's country strategy for PNG at that time focused on improving (i) governance; (ii) private sector development, factor productivity, and market access through selected infrastructure investments; and (iii) social indicators. In the roads sector, ADB strategy was to establish a

¹ The revised design and monitoring framework is in Appendix 1.

² ADB. 1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Papua New Guinea for the Road Maintenance and Upgrading (Sector) Project*. Manila. (Loan 1709-PNG, approved on 16 November).

tradition of good maintenance, an autonomous road authority, and a road trust fund to improve sector performance and secure long-term financial sustainability. In line with this strategy, and following a sector-wide approach, the Project was designed to improve road infrastructure in the Highlands.

B. Objectives and Scope

6. The objectives of the Project as described in the RRP were to contribute to economic growth through increased exports and integrate the Highlands' subsistence population into the mainstream economy by (i) improving critical road links, (ii) establishing a sustainable and effective road maintenance operation in the region, and (iii) improving sector management. The scope of the Project as defined in the Loan Agreement (Loan 1709-PNG)³ comprised four parts:

- (i) road improvements in the Highlands by carrying out subprojects consisting of (a) upgrading of approximately 220 km of roads, and (b) asset management for road networks, including rehabilitation of approximately 450 km of roads;
- (ii) provision of formal technical training to strengthen the institutional capacity of the Department of Works (DOW) to undertake road maintenance and operation;
- (iii) provision of detailed engineering design and construction supervision support for the preparation and execution of subprojects; and
- (iv) strengthening project implementation and road maintenance operations through inter alia: (a) on-the-job training on the use of the road asset management system (RAMS); (b) assistance in identification of technical training programs, contract supervision, management, and quality control; (c) formulation of community employment programs; (d) road network performance monitoring; and (e) financial management.

C. Cost Estimates and Financing Plan

7. The total cost of the Project, including taxes, duties, and interest during construction, was estimated at \$115 million equivalent. ADB agreed to provide from its ordinary capital resources (OCR) a loan of \$63 million equivalent, financing 48% of civil works and 55% of the total project cost.

8. ADB's loan was provided over 25 years, with a grace period of 5 years and an interest rate determined in accordance with ADB's pool-based variable lending rate system for US dollar loans. Loan 1709-PNG was amended on 15 December 2002 to convert it into a London interbank offered rate (LIBOR)-based loan with standard lending terms. In September 2003, ADB approved the increase in ADB's share of financing for civil works from 48% to 70%. This necessitated scaling down the project scope and total project cost from \$115 million to \$90.6 million.⁴ The original and revised project cost estimates and financing plans are shown in Table 1.

³ ADB. 1999. Loan Agreement (Ordinary Operations), Road Maintenance and Upgrading (Sector) Project between the Independent State of Papua New Guinea and Asian Development Bank. Manila (17 November).

⁴ The length of upgraded road was reduced from 220 km to 145 km, and of rehabilitated road from 450 km to 290 km. In hindsight, the need for ADB financing was lower than expected, as few subprojects were approved or contracts awarded. As a result, scaling down the project scope appears to have been unnecessary.

Table 1: Original and Revised Cost Estimates and Financing Plan
(\$ million)

Item	Original			Revised		
	Total Cost	Govt.	ADB	Total Cost	Govt.	ADB
A. Civil Works						
1. Road Upgrading	50.0	21.3	28.7	34.8	6.1	28.7
2. Road Asset Management including Rehabilitation	27.4	18.7	8.7	18.6	9.9	8.7
Subtotal (A)	77.4	40.0	37.4	53.4	15.9	37.4
B. Training and Stakeholder Relations						
1. Training	1.5	1.5	0.0	1.5	1.5	0.0
2. Community Development	0.7	0.7	0.0	0.7	0.7	0.0
Subtotal (B)	2.2	2.2	0.0	2.2	2.2	0.0
C. Consulting Services						
1. Engineering Design and Construction Supervision	6.0	0.9	5.1	6.0	0.9	5.1
2. Support to Implementation and Highlands Region Maintenance Group	8.5	0.8	7.8	8.5	0.8	7.8
Subtotal (C)	14.5	1.7	12.8	14.5	1.7	12.8
D. Land Acquisition	7.8	7.8	0.0	7.8	7.8	0.0
Interest During Construction	12.7	0.0	12.7	12.7	0.0	12.7
Total	114.6	51.7	63.0	90.6	27.6	63.0

ADB = Asian Development Bank, Govt. = government.

Source: ADB. 1999. *Report and Recommendation of the President to the Board of Directors on Proposed a Loan to the Papua New Guinea for the Road Maintenance and Upgrading (Sector) Project*. Manila (Loan 1709-PNG, approved on 16 November); and ADB memo: Request for Major Change in Implementation Arrangements (Increase in ADB Loan Share of Project Costs), 19 September 2003.

D. Status of and Progress in Project Implementation

9. The Project started in November 2000 with the recruitment of a consulting firm to assist in implementation. A team of implementation advisors was fully mobilized in August 2002. The Highlands Region Maintenance Group (HRMG)—consisting of implementation advisors, project managers and maintenance managers from DOW, and provincial works managers—was established to implement the Project. As of April 2006, the Project had achieved 60% of implementation and 32% of loan disbursement. Progress in project implementation was rated satisfactory in ADB's project performance report (PPR). Activities undertaken under the Project have included (i) road upgrading and rehabilitation in five provinces, (ii) RAMS extension, (iii) training, and (iv) minor rehabilitation contracts. The status of activity implementation is described below.

10. **Road Upgrading and Rehabilitation.** To date, ADB has approved 19 subprojects, involving 249.61 km of road upgrading and 211.41 km of road rehabilitation. Loan 1709-PNG financed 13 road subprojects, involving 161.41 km of road upgrading and 176.51 km of road rehabilitation. The other six subprojects were entirely financed by the Government. As of May 2006, of 19 road subprojects with 21 contracts, four subprojects had been completed, and seven contracts awarded. Civil works on five roads were in progress, two of which, covering about 31 km, were 90% complete. One contract awaited signing, and the remaining nine contracts were at various stages of tendering.

11. **RAMS Extension Subproject.** RAMS, an integrated pavement and maintenance management system, is a central planning instrument to support maintenance scheduling, prioritizing maintenance needs, and preparing budget proposals. It was established in DOW with

the support of two ADB-funded technical assistance (TA) projects.⁵ ADB approved a RAMS extension subproject under Loan 1709-PNG in November 2001. The objective of the subproject was to deliver training to enable government counterpart staff to incorporate RAMS as an integral part of DOW's overall asset management system and RAMS to function as a self-sustaining, wholly indigenously operated method of planning and budgeting for road maintenance in PNG.

12. The international consulting firm that was engaged under the two ADB TA projects⁶ to establish RAMS nationally and extend it to the provinces was contracted to provide the training services through the direct selection procedure. According to the final report of the consultant, from February 2002 to June 2005, (i) 77.5 person-months of consulting services were provided, (ii) over 50 formal training sessions conducted, and (iii) 700 government officials trained. The scope of the training included road surveying; data collection; project management in interfacing RAMS with operations; prioritizing maintenance needs; and the use of databases, data, and maps.

13. **Training.** The consulting firm engaged to assist in project implementation has provided some training to HRMG counterpart staff members to enhance their technical capability to design and manage road projects. From 2001 to 2005, the consulting firm developed a strategic human resource development plan and 22 training aids and users' manuals, and provided 41 training to 118 government officials from DOW provincial offices, provincial planning offices, and other provincial offices in the form of on-the-job training or training courses. Training areas included engineering design, project management, financial management, contract administration and construction supervision, quality control, road upgrading and maintenance methods, computer skills, documentation, and procedures. Improvement in the capacity of counterpart staff in the areas of engineering design, contract administration and construction supervision, quality control, and computer skills is clearly evident.

14. **Minor Rehabilitation Contracts.** Between 2001 and June 2005, HRMG helped DOW and provincial works officers recruit local contractors to provide routine and emergency road maintenance in the five Highlands provinces. HRMG reviewed the draft contracts and supervised construction works. Altogether, 112 projects covering about 1,000 km with a total contract value of K21.47 million were completed. In addition, HRMG awarded several community-based contracts to carry out routine maintenance in the region. These civil works contracts provided job opportunities to local communities and played an important role in keeping the roads in good condition.

15. **Compliance with Covenants of Loan 1709-PNG.** Most of the covenants of Loan 1709-PNG have been complied with. However, two covenants addressing sector issues were only partly complied with (footnote 6).

⁵ ADB. 1998. *Technical Assistance to Papua New Guinea for the Road Asset Management Project*. Manila (TA 3004-PNG for \$1.0 million); and ADB. 1999. *Technical Assistance to Papua New Guinea for the Road Asset Management System in the Provinces*. Manila (TA 3378-PNG for \$0.581 million).

⁶ Covenant of paragraph 8 of schedule 5 of the loan states: "The Borrower shall establish, within three months of the Effective Date, a road maintenance trust account for each province within the Highlands Region, to be operated in accordance with arrangements satisfactory to ADB, and deposit therein each year in total [of] not less than 15 million kina in 1999 prices (i.e., three million kina for each province within the Highlands Region) in quarterly payments, adjusted in each year for annual inflation, in the following minimum amounts for each quarterly installment: First Quarter 20 percent; Second Quarter 30 percent; Third Quarter 30 percent; and Fourth Quarter 20 percent. Covenant of paragraph 4a of schedule 5 of the loan states that, by 31 December 2000, the Borrower shall: (a) taking into account the recommendations made under the Cost Recovery TA (i) fully implement, by outsourcing or otherwise, effective axle-load testing and control and (ii) establish and commence implementation of an appropriate scale of fines to deter axle-overloading and (b) complete installation of an operational weighbridge in Lae in accordance with arrangements satisfactory to ADB."

16. For the first covenant, it appears that the deadline was not realistic. The provincial trust accounts were not established in light of the Government's efforts to improve fiscal discipline and the potential risk that the funds would be misused. However, sufficient funds have been disbursed or allocated by the Government for maintaining the roads. The Government disbursed or allocated from its budget over K120 million for maintaining roads in the Highlands over the life of the Project. This is more than the K15 million a year initially agreed. The counterpart funds directly required for the approved subprojects have been sufficient.

17. The second covenant was not complied with in due course, but the following positive developments are noteworthy. A proposal for outsourcing was submitted by the consultants in January 2003 and is currently being processed by the National Road Authority (NRA) for the bridge in Lae, which is the only location identified so far where it has been necessary to have such control in place (a management contract reviewed by ADB will soon be submitted to the successful operator). The Department of Transport (DOT) has developed a scale of fines to deter axle-overloading that is currently under review by NRA. Finally, the weighbridge in Lae is in good operating condition. It is also important to note that the Lae bridge facility was not operated by DOW, but by DOT initially in 2005 and then by NRA. These developments are consistent with the policy dialogue conducted with ADB on road sector reform. Proceeds from the operations will be allocated to the road fund administered by NRA.

18. **Likelihood of Achieving the Development Objectives.** Project implementation was substantially delayed in the early years, but it gained momentum in 2004. With a more experienced project implementation officer and lessons learned, the Project is making steady progress and having a major impact in the Highlands. Clear evidence exists that passenger and freight traffic has increased significantly on the roads completed under Loan 1709-PNG. With more roads completed one after another in the next 2 years, a major impact on economic and social development in the Highlands is expected. The likelihood of achieving development objectives was rated satisfactory in the PPR.

19. **Strengths and Weaknesses of the Project.** The Project has a good geographic focus. It serves a populous region with great development potential. The objectives of the Project are in line with the Government's development strategy and its transport sector development strategy. It addresses human basic needs and promotes industrial and agricultural activities, exports, tourism, income generation, and social cohesion in the Highlands by facilitating access between production areas and market centers. HRMG is experienced and involving a larger number of local technical staff in project design and supervision. This has contributed to capacity development in the road sector of the five project provinces, and to retaining that expertise in the provinces. The project implementation start-up delay was partly due to the difficulty of setting up HRMG as a functional project implementation unit. Formal training provided by implementation advisors, combined with learning by doing, has brought clear improvement in the capacity of HRMG in the areas of engineering design, contract administration, construction supervision, quality control, and computer skills. HRMG's existence and improved capacity will facilitate implementation of supplementary financing.

20. **Lessons Learned.** The design of supplementary financing has taken into account the lessons learned under Loan 1709-PNG, which are detailed in Appendix 2. Loan 1709-PNG followed the sector lending approach. Identifying road subprojects and providing economic, environmental, and social justifications, as well as cost estimates, which should have been done at the project preparatory stage, were left until after ADB approved the loan. Identifying and approving each subproject proved to be time-consuming. Procurement followed the two-stage bidding process with prequalification, even though the small construction sector in PNG has limited competition. This resulted in delayed contract awards.

21. Building on the efforts already made by the Government and the international consulting team, supplementary financing has prioritized 11 roads from 45 subproject pre-investment studies and will submit them for ADB one-time approval. Due diligence on technical, economic, financial, and environmental viability, and social safeguards, have been completed and scrutinized for all 11 roads. Cost estimates were based on the characteristics of the selected roads, types of intervention, quantities required, and realistic unit costs. Procurement will follow the one-stage one-envelope procurement procedure with post-qualification. A more experienced project implementation office is already in place and has been active in project preparation. These measures promise to substantially improve project performance.

III. THE PROPOSED SUPPLEMENTARY FINANCIAL ASSISTANCE

A. Proposed Supplementary Financing

22. Supplementary financial assistance will provide financing for (i) additional upgrading⁷ and rehabilitation of road sections corresponding to the 11 subprojects, with a total length of 270 km in the five Highlands provinces, and (ii) related consulting services for detailed engineering design, preconstruction activities, construction supervision, project performance monitoring and evaluation, and training on road maintenance, road safety, and STI/HIV/AIDS prevention. Eleven road sections⁸ have been screened and pre-selected for supplementary financing based on various criteria such as (i) their linkage with subprojects already approved by ADB under Loan 1709-PNG, (ii) Government priorities,⁹ (iii) economic rate of return, (iv) social and environmental considerations, and (v) public consultations. ADB conducted extensive consultations with the central and provincial governments and local stakeholders on the selection of the road subprojects in November 2005 and March 2006. The names of the provinces, road sections, types of treatment, and length are shown in Table 2.

Table 2: Prioritized Road Sections

Province	Road Section	Length (km)	Treatment
Eastern Highlands	Okapa–Raipinka	51	Rehabilitation
	Kamaliki–Move	34	Rehabilitation
	Goroka–Lahame	13	Upgrading
Western Highlands	Kindeng–Kondopina	11	Upgrading
	Banz–Dona	19	Upgrading
Chimbu	Gewa–Gembogl	21	Rehabilitation
	Kerowagi–Dona	29	Rehabilitation
	Korinige–Kerowagi	7	Upgrading
Enga	Warumanda–Laiagam	31	Upgrading
Southern Highlands	Ialibu–Kagua	32	Rehabilitation
	Ialibu–Pangia	22	Rehabilitation

km = kilometer

Source: Asian Development Bank.

B. Impact and Outcome

23. The impact and outcome of the supplementary financing are in line with those of the Project ADB approved in 1999. It aims to scale up the Project's impact on PNG economic development and social integration by financing more road sections to (i) improve road access for the private

⁷ Upgrading means sealing, without widening and realigning the road.

⁸ All 11 roads are from the long list in the RRP. They are the continuation of the roads financed by Loan 1709-PNG.

⁹ The 11 roads were further prioritized from the Government priority list sent in June 2005.

businesses and communities, (ii) reduce their travel costs and time to major commercial and service centers, and (iii) enable them to tap economic and social opportunities in the Highlands. It will support the Government's efforts to enhance export-led economic growth, generate income for local communities, and reduce poverty. The outcome will be improved rural access to market centers.

C. Rationale

24. Justifying supplementary financing in this Project are four main points. Firstly, the proceeds of Loan 1709-PNG have been fully committed and are able to finance only a total of 338 km (consisting of 161.41 km of upgraded road and 176.51 km of rehabilitated road). This length constitutes only 50.4% of the total length of the roads originally targeted (670 km including 220 km of upgraded road and 450 km of rehabilitated road). The financial shortfall was due to a combination of factors, including underestimation of costs at the time of appraisal, delayed project implementation, and lack of competition in PNG's construction sector. Loan 1709-PNG did not budget any physical and price contingencies. Civil works base cost estimates for some road sections were very low. Inflation between 1999 and 2003 was double digit. The delay in project implementation meant actual costs were much higher than envisaged at appraisal, for labor by 5–6 times, equipment 5–30 times, and materials 1.8–2.9 times. Lack of competition in PNG's construction sector resulted in high bid prices. The reduced project scope, if not remedied, will certainly compromise the achievement of the intended purposes and objectives as initially conceived for the Project. With the additional proposed subprojects financed by supplementary loans, the total length of roads financed by ADB will reach 608 km (including 242.41 km for upgrading and 365.51 km for rehabilitation), enabling achievement of 91% of the original project scope. The selected roads are continuations of ongoing road subprojects financed under Loan 1709-PNG, as indicated in the map, and will increase connectivity.

25. Secondly, deteriorating transport infrastructure is a particular concern for PNG. Four years ago, a study completed by the Eastern Highlands Chamber of Commerce and Industry revealed that poor road conditions caused an estimated 30% decline in coffee shipped from Eastern Highlands Province. Crime rates also increased as a result of the poor roads, with coffee stolen from buyers.

26. The Government attaches great importance to improving transport infrastructure to achieve its overarching development strategy of export-driven economic growth, rural development, and poverty reduction. Transport infrastructure rehabilitation and maintenance is the first of seven expenditure priorities in the Government's Medium-Term Development Strategy (2005–2010) (MTDS). The proposed financing of subprojects is in line with the MTDS and the latest National Transport Development Plan 2006–2010, the implementation plan for the MTDS. The Highlands are indeed strategically important for the country, as they are richly endowed with natural and tourism resources and ecological conditions for farming, as well as being home to almost half of the population. Developing the infrastructure network in this region will have significant impact on PNG's overall economic and social performance. The country's most significant road, the Highlands Highway, runs through the region, bringing to Lae port copper, coffee, and tea (the country's major export items) and distributing in the region imports ranging from heavy machinery to food. The Government has set aside K225 million for the next 4 years to upgrade and rehabilitate the Highlands Highway. It is also planning to invest in Lae port and has officially requested ADB assistance in expanding Lae port capacity. It would be timely for ADB to provide the additional financing to upgrade and rehabilitate more roads that connect major farming areas, resource and population centers, and tourist sites in the Highlands region to the Highlands Highway. The additional financing will complement efforts by the Government and ADB, particularly with respect to developing Lae port.

27. Thirdly, the proposed supplementary financing is consistent with the ADB country strategy for PNG, as documented in the country strategy and program (CSP) update 2005–2006¹⁰ and in discussions on the CSP 2006–2010¹¹, currently under preparation. Programming discussions have agreed that the transport sector is one of four priority sectors or themes for the upcoming CSP 2006–2010, with ADB support to focus on the roads and maritime subsectors.

28. Fourthly, supplementary financing will be efficient and cost effective in terms of project preparation and implementation by capitalizing on the established project implementation office and strengthened capability. It has taken more than 2 years for the Project to set up HRMG as a functional project implementation unit. With on-the-job and formal training provided by international consultants, and learning by doing, HRMG has strengthened its capacity and finally become a fully fledged project implementation office consisting of a designing arm and a construction supervision team. It is capable of implementing more subprojects, including engineering design, preparing bidding documents, tendering and awarding contracts, and supervising construction, without incurring substantial start-up costs. HRMG is currently implementing the Project efficiently. It will likely be able to implement additional proposed subprojects in the same fashion, resulting in start-up cost savings of at least \$2 million.

29. The proposed supplementary financing meets the eligibility criteria specified in the policy paper on supplementary financing approved in November 2005. The additional road upgrading and rehabilitation subprojects identified for financing by the supplementary loans are within the original project scope and continue to be a priority in the Government's development strategy. Supplementary financing will help achieve the objectives of Loan 1709-PNG, which were to contribute to PNG economic development and social integration by improving road infrastructure. Supplementary financing will benefit from the established international consulting team, a seasoned project implementation office, and enhanced technical expertise gained from the Project. It is technically feasible, institutionally sound, and economically viable.

D. Safeguards

30. Due diligence has been done to ensure that environmental and social safeguards for the selected 11 road subprojects accord with ADB policies. Since the Project involves interventions on existing road alignments, and will not entail land acquisition or involuntary resettlement; it has been classified as category C regarding involuntary resettlement and indigenous people.

31. The environmental categorization for the 11 subprojects is category B. Initial environmental examinations (IEEs) were carried out for all 11 roads, and IEE reports for 11 roads and a summary IEE (SIEE) were prepared. According to IEEs, none of the selected roads passes through environmentally sensitive or conservation area. Most of the adverse environmental impacts are related to regular construction activities, which are temporary and can be mitigated by taking measures detailed in the environmental management and monitoring plans (EMMP). Environmental impacts such as noise, reduced air quality, and traffic accidents during the operational phase are considered low because of the low traffic volume. No cumulative environmental impacts were identified.

E. Revised Cost Estimates

32. The total cost of the proposed subprojects for supplementary financing—including civil works, consulting services, contingencies, taxes and duties, interest during construction, and other

¹⁰ ADB. 2005. *Papua New Guinea Country Strategy Program Update (2005–2006)*. Manila.

¹¹ ADB. 2006. *Papua New Guinea Country Strategy Program (2006–2010)*. Manila (for board approval in 2006).

financial charges—is estimated at \$78.07 million equivalent. Estimates of the base cost for civil works are derived from the actual costs of ongoing road subprojects, geotechnical and topographic surveys, and further investigation of quantities and sources of materials. Cost estimates for the proposed subprojects are summarized in Table 3 and are detailed in Appendix 3.

Table 3: Cost Estimates for Proposed Subprojects
(\$ million)

Item	Total Cost
A. Base Cost	
1. Civil Works	53.25
B. Consulting Services	10.43
1. Engineering Design, Preconstruction Activities, Construction Supervision, Performance Monitoring and Evaluation, and Training on Road Main & Safety, and STI/HIV/AIDS Prevention	3.21
2. Project Design	2.66
3. Construction Supervision	4.26
4. Financial Auditing	0.06
5. Training on Road Main, Safety, and STI/HIV/AIDS	0.24
C. Contingencies	9.99
1. Physical Contingencies	5.32
2. Price Contingencies	4.67
Subtotal (A+B+C)	73.67
D. Interest during Construction and Commitment Charge	4.40
Total	78.07

Source: Asian Development Bank estimates.

33. The total cost of the Project is \$168.67 million equivalent as summarized in Table 4.

Table 4: Consolidated Total Project Cost
(\$ million)

Item	Original	Revised	Supplementary	Total Cost
A. Base Cost				
Civil Works	77.40	53.40	53.25	106.65
B. Consulting Services	16.70	16.70	10.43	27.13
1. Engineering Design, Preconstruction Activities, Construction Supervision, Performance Monitoring and Evaluation, and Training on Road Maintenance and Safety, and STI/HIV/AIDS	8.50	8.50	3.21	11.71
2. Project design and supervision	6.00	6.00	6.92	12.92
3. Financial auditing	0.00	0.00	0.06	0.06
4. Training on Road Main, Safety, and STI/HIV/AIDS	2.20	2.20	0.24	2.44
C. Contingencies	0.00	0.00	9.99	9.99
1. Physical Contingencies	0.00	0.00	5.32	5.32
2. Price Contingencies	0.00	0.00	4.67	4.67
Subtotal	94.10	70.10	73.67	143.77
D. Land Acquisition	7.80	7.80	0.00	7.80
E. Interest during Construction and Commitment Charge	12.70	12.70	4.40	17.10
Total	114.6	90.60	78.07	168.67

Note: The original and revised costs have been presented in a format consistent with the supplementary cost estimates.
Source: Asian Development Bank estimates.

F. Revised Financing Plan

34. For supplementary financing, the Government has requested ADB to provide a blend of two loans for a total of \$53 million, consisting of an OCR loan of \$35 million and a loan in various currencies equivalent to SDR12,075,000 (equivalent to \$18 million, as of 1 June 2006) from the Asian Development Fund (ADF), to cover the additional project financing need. The OCR loan will carry a term of 24 years, with a grace period of 4 years, an interest rate determined in accordance with ADB's LIBOR-based lending facility, a commitment charge of 0.75% per annum, and such other terms and conditions as set forth in the draft OCR loan. The Government has provided ADB with (i) the reasons for its decision to borrow under ADB's LIBOR-based lending facility on the basis of these terms and conditions, and (ii) an undertaking that these choices were its own independent decision not relying on any communication or advice from ADB. The ADF loan will have a maturity of 32 years, including a grace period of 8 years, an interest charge of 1% per annum during the grace period and 1.5% per annum thereafter, equal amortization, and such other terms and conditions as set forth in the draft ADF loan. ADF and OCR loans will be disbursed on a pro rata basis (Appendix 4).

35. ADB will finance 68% of the total cost of the additional road subprojects in the Project, while the Government will provide \$25.07 million equivalent to finance the remaining cost.¹² The financing plan is presented in Appendix 3 and summarized in Table 5.

Table 5: Financing Plan for Proposed Subprojects
(\$ million)

Source	Total Cost	Percentage
Asian Development Bank	53.00	68
OCR	35.00	45
ADF	18.00	23
Government	25.07	32
Total	78.07	100

ADF = Asian Development Fund, OCR = ordinary capital resources.

Source: Asian Development Bank estimates.

36. The use of ADF financing is justified by ADB's country classification for PNG and PNG's social and economic status. As ADB's current country classification stands, PNG is a category B2 country whose limited debt repayment capacity entitles it to limited ADF financing.

37. A World Bank assessment¹³ found that the incidence of poverty in PNG had increased significantly in recent years. Using a poverty line that allows for 2,200 calories per adult equivalent per day and an allowance for basic nonfood expenditure, which is similar to the PNG national poverty line, 37.5% of the PNG population was considered poor in 1996. This figure had risen to 54% in 2003. The trend was the same for the international poverty line of \$1 per day, by which the estimated incidence of poverty had grown from 25% to 40%. In terms of the human development index, PNG ranked 133 out of 177 countries in 2004. Its social indicators are among the lowest in the Pacific region. The Highlands, home to the highest portion of the poor, are mountainous and geologically unstable, with torrential rains that can last 6 or 7 months. Road construction and maintenance are costly, requiring concessional funding.

¹² Budgeted in the Government's development budget as a separate line item. The Government has provided counterpart funding for Loan 1709-PNG. With its improved financial position, the Government is willing and able to provide the counterpart funding for the supplementary financing subprojects.

¹³ World Bank. 2004. Poverty Assessment (Papua New Guinea). Washington, DC.

38. ADB loans for the Project will amount to \$116 million equivalent, financing about 69% of the total project cost. The consolidated financing plan for the Project is shown in Table 6.

Table 6: Consolidated Financing Plan for the Project
(\$ million)

Source	Total	Percentage
Asian Development Bank	116.00	69.00
Government	52.67	31.00
Total	168.67	100.00

Source: Asian Development Bank estimates.

G. Implementation Arrangements

1. Executing Agency, Project Implementation Unit, and Project Steering Committee

39. DOW will continue as the Executing Agency. HRMG, assisted by a team of international and local consultants, will continue as the project implementation unit. HRMG headed by a field project manager will maintain an office in each province, comprising an implementation advisor, a community relations officer, and other necessary staff. HRMG will

- (i) design the subprojects and prepare the bidding documents,
- (ii) handle the bidding process,
- (iii) provide construction supervision and manage contracts,
- (iv) monitor the project progress,
- (v) prepare withdrawal applications,
- (vi) maintain project accounts and complete the financial records for auditing,
- (vii) prepare project progress reports and the project completion report,
- (viii) monitor environmental and socioeconomic impacts,
- (ix) implement a cost-effective contracting-out system for road maintenance and so ensure the roads completed under Loan 1709-PNG and supplementary loans are properly maintained, and
- (x) provide training on road maintenance, road safety, and STI/HIV/AIDS prevention.

The project steering committee will continue to ensure close interagency coordination and monitor implementation of the Project. Its composition and mode of functioning will not change.

2. Implementation Period

40. The proposed subprojects will be implemented over 3.5 years, with civil works commencing in April 2007 and project completion by the end of 2009. The detailed implementation schedule is attached as Appendix 5. The project completion date for Loan 1709-PNG will be extended to 31 December 2009 to accommodate the proposed subprojects under the supplementary loans.

3. Procurement

41. Procurement of civil works under the supplementary loans will follow ADB's *Procurement Guidelines*. Civil works will be divided into 16 contract packages as listed in the procurement plan (Appendix 6). Since the procurement threshold for PNG is \$3 million, five of the packages will be procured under national competitive bidding (NCB) without excluding foreign contractors and joint ventures, and 11 will be procured under international competitive bidding (ICB). Single-stage one-

envelope bidding procedure with post-qualification will be used for both ICB and NCB contract packages to streamline the bidding process. Contractors with adequate technical and financial capacity will be allowed to bid for several packages and may be awarded more than one contract based on the least-cost combination of contracts.

4. Consulting Services

42. International consulting services will be required to assist in (i) detailed engineering design, (ii) preconstruction activities, (iii) construction supervision, (iv) project performance monitoring and evaluation, and (v) training on road maintenance and safety and on STI/HIV/AIDS prevention. Under Loan 1709-PNG, an international consulting firm (the initial consultant) was recruited on a competitive basis to assist in project design and implementation, construction supervision, and training. As Loan 1709-PNG followed a sector approach, the initial consultant has helped HRMG complete pre-investment studies on more than 45 subprojects for ADB consideration, including the proposed 11 road sections. Engineering design, preparing bidding documents, and implementing road subprojects financed by supplementary loans are tasks that represent a natural continuation of the previous work carried out by the initial consultant.

43. After years of working in the Highlands, the initial consultant has acquired knowledge about the PNG road sector, the local culture, and the topographic and geotechnical conditions of the studied subprojects. Continuity in technical approach, experience acquired, and continued professional liability necessitates continuing the initial consultant's services. The project implementation schedule in Appendix 5 assumes that the existing institutional arrangements for project implementation, including the services of the initial consultant, will be maintained. From the cost perspective, retaining the services of the initial consultant will save at least \$2 million in consulting services, because its current contract will end in June 2008, and will only need to be extended by 1.5 years.

44. Recruiting a new consultant has been considered and found impractical. Firstly, the selection process would take at least 6 months. Secondly, consultant mobilization may take another 1–2 years, as happened in this Project and others in PNG. Thirdly, engineering design and bidding for civil works will take another year. This means that initial implementation delays under Loan 1709-PNG will be repeated under the supplementary loans if new recruitment is conducted.

45. In summary, retaining the services of the initial consultant observes ADB's principles of economy and efficiency. Hence, the single-source selection method for the continuation of the initial consultant is proposed for the international consulting services. It is proposed that the initial consultant's contract be extended by 1.5 years (132 person-months), from June 2008 until December 2009. The Borrower will ask the initial consultant to prepare technical and financial proposals on the basis of the outline terms of reference presented in Appendix 7.

46. Domestic consulting services for project design, construction supervision, financial auditing, and training on road maintenance, road safety, and STI/HIV/AIDS prevention for the Project will be required and financed by the Government. The Government will recruit the domestic consultants following Government procedures acceptable to ADB.

5. Advance Procurement Action

47. The Government requested ADB's approval of advance procurement action for recruiting consulting services and procuring civil works. Approval of advance action was granted during the management review meeting. Advance action covers inviting bids, bidding, and bid evaluation but not awarding contracts. Advance action will be undertaken in accordance with ADB's *Procurement*

Guidelines and Guidelines on the Use of Consultants. The Government has been advised that approval of advance action does not commit ADB to financing the Project.

6. Disbursement Arrangements

48. Supplementary loans will be disbursed in accordance with ADB's *Loan Disbursement Handbook*. Direct payment and reimbursement procedures will be used for road subprojects financed by the supplementary loans.

7. Accounting, Auditing, and Reporting

49. Recent experience indicates that financial management with regard to accounting, auditing, and reporting is satisfactory and does not require adjustment. DOW will continue to maintain separate accounts to identify civil works and services financed by Loan 1709-PNG and supplementary loans, prepare separate financial statements indicating the sources and application of funds, and have them audited by an independent auditor acceptable to ADB. Financial auditing has been budgeted under the Project and will be funded by the Government. The audited project accounts and the auditor's reports will be provided to ADB in English within 6 months after the end of each financial year. DOW will prepare and submit to ADB quarterly project progress reports and provide to ADB a project completion report within 3 months of project completion.

8. Project Performance Monitoring and Evaluation

50. ADB and the Government will agree, prior to April 2007, upon a set of indicators for monitoring and evaluating project performance and the performance of each road subproject financed by Loan 1709-PNG and supplementary loans in relation to the Project's goals and purposes, with an emphasis on economic and social activities. Six person-months of international consulting services will be provided under the Project to establish and monitor indicators and evaluate project performance. The consultant will

- (i) establish a set of social and poverty impact indicators for the Project and gender-disaggregated baseline data for road sections whose civil works have not commenced;
- (ii) review and compare the data during project implementation and completion;
- (iii) monitor and evaluate ongoing and completed road sections;
- (iv) prepare subproject completion reports;
- (v) provide hands-on training on data collection and monitoring to DOW; and
- (vi) assess the overall socioeconomic impacts of the Project. The indicators may include (a) economic activities and income level in the project area, (b) industrial and agricultural outputs, (c) transport costs and time, (d) transport services and charges, (e) accident rates, (f) level of social services including school enrollment and infant mortality, (g) access to STI/HIV/AIDS information and service, and (h) jobs created (employment impact indicators will include information about unskilled laborers, poor laborers, and women laborers).

9. Project Review

51. ADB will review the Project every 6 months. Each review will cover all relevant aspects that may have an impact on the Project's performance and continuing viability, either institutional, administrative, organizational, technical, environmental, social, economic, the status of compliance with covenants stipulated in each loan, financial, or other aspects.

10. Anticorruption Measures

52. ADB has recently completed a project procurement-related audit of the Project and found no clear indications of potential fraud and corruption. ADB's *Anticorruption Policy* (1998) was explained to the Government and DOW and discussed with them. The Government and DOW shall adhere to ADB anticorruption requirements during project implementation. Consistent with its commitment to good governance, accountability, and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Project. To support these efforts, relevant provisions of ADB's *Anticorruption Policy* are included in the loan regulations and the bidding documents for the Project. In particular, all contracts financed by ADB in connection with the Project shall include provisions specifying the right of ADB to audit and examine the records and accounts of DOW and all contractors, suppliers, consultants and other service providers as they relate to the Project. If ADB determines that representatives of the Borrower, a beneficiary, a contractor, and/or a consultant engaged in corrupt, fraudulent, collusive or coercive practices, ADB may take the following actions: (i) reject any proposal for contract award and/or (ii) declare any firm or individual ineligible for ADB-financed contracts, indefinitely or for a stated period of time.

IV. PROPOSED SUPPLEMENTARY FINANCING BENEFITS, IMPACTS, AND RISKS

A. Benefits

53. The proposed supplementary financing will generate substantial economic benefits. Normal traffic growth rates were based on the projected gross domestic product (GDP) growth rate estimated to be 3% annually for 2006–2025. Additional traffic is generated either because a journey becomes more attractive by virtue of its costing less or because of the increased development brought about by the improved roads. For all selected road sections to be improved, the generated traffic is assumed to equal 5% of normal traffic that would occur during the first year after rehabilitation works end. This assumption is made based on the presence of intense agricultural activities in the 11 identified project areas.

54. The economic analysis was carried out for the 11 subprojects by comparing scenarios with and without the Project using the highway design and management model. The economic analysis covers 20 years (2006–2025) for the upgrade-to-sealed option and 15 years (2006–2020) for re-gravelling, with the construction periods varying between 1 and 2 years starting in 2007. All benefits and costs are in constant 2006 prices. All prices are expressed in PNG kina.

55. The economic costs of all the subprojects proposed for financing under the supplementary loans are (i) the capital cost, including labor, equipment and materials, consulting services and physical contingency, and (ii) the costs of maintaining project roads. The economic benefits arise from (i) savings in vehicle operating cost, particularly repair costs, from improved road conditions; (ii) savings in maintenance costs; (iii) time savings for road users; and (iv) benefits to generated traffic. The subprojects proposed for financing under the Project will also have other benefits, such as improving food security and access to economic and social services, which were not included in the economic internal rate of return (EIRR) calculation.

56. Using a 12% discount rate, the economic benefits are substantial. The net present value is \$56.89 million, and the EIRR is 18.8%. The results of the sensitivity analysis confirmed the

economic viability of all proposed subprojects. The switching value¹⁴ for increased rehabilitation costs was determined to be 42.5%, and the switching value for decreased benefits 29.9%. In the worst-case scenario, with a combination of increased costs and decreased benefits, the net present value would be reduced to K8.16 million, and the EIRR to 12.91%. The detailed economic analysis is attached in Appendix 8.

57. According to a recent assessment by the International Monetary Fund,¹⁵ PNG's economy has been performing well since 2004. Real GDP grew by 3% in 2004, and a similar growth rate is expected for 2005. A sharp reduction in inflation occurred in 2004, and inflation is estimated to have averaged 1% in 2005. External accounts are expected to be in surplus in 2005. Fiscal outcome also improved in 2005, with a budget deficit of 0.6%. As a result, public sector debt, about half of which is external, shrank from 72% of GDP in 2002 to 49% in 2005. The Government is continuing to rationalize public expenditure with the objective of controlling debt while increasing expenditure on priority areas such as transport infrastructure. Counterpart funding for ADB projects is treated as a priority and has been provided to Loan 1709-PNG. Budget allocation for road maintenance has increased substantially from K15 million–K20 million to K100 million in 2006. The road fund has been established with an initial allocation of \$20 million from the fuel tax. In view of these developments, the Project is considered to be financially sustainable.

B. Poverty Reduction Impact

58. The proposed subprojects financed under the Project will contribute to alleviating poverty in the Highlands by providing job opportunities and promoting agricultural development through improved road access. Upgrading and rehabilitating the 11 roads will directly generate an estimated 1,500 local employment opportunities. The maintenance program for the roads completed under the Project will provide additional income opportunities for 6,000 people.

59. PNG's economy is highly dualistic, with a small modern sector coexisting with a large subsistence sector. More than 85% of the population resides in rural areas, surviving by subsistence agriculture and/or cash crop production. The Highlands are fertile but have the highest incidence of poverty because residents are isolated from market and social service centers. The 11 proposed road sections connect the Highlands' major coffee, fruit, and vegetable production areas to the Highlands Highway and city centers, serving a population of more than 600,000. Improved and rehabilitated roads will help farmers increase their income from cash crops by easing access to markets and reducing costs for traders collecting produce, as well as by allowing farmers to tap market opportunities in city centers. The increased income and improved road conditions will facilitate access to education and health services in city centers, thereby contributing to the well-being of the population.

C. Social and Gender Impact

60. The social and gender impacts of the subprojects to be financed under the Project were assessed during the ADB Fact-Finding Mission, and a summary of the poverty reduction and social strategy appears in Appendix 9. It was found that women in the Highlands are currently involved in a broad range of activities related to road construction, road maintenance, and commercial roadside services. The proposed subprojects will provide more income-earning opportunities for women. An estimated 25–30% of the workforce for the Project will be women.

¹⁴ The switching value shows the percentage increase in a cost variable (or decline in a benefit variable) required for the net present value to become zero, which is the same as the EIRR reducing to the cut-off level of 12%.

¹⁵ International Monetary Fund. 2006. IMF Concludes 2005 Article IV Consultation with Papua New Guinea. Washington, DC.

61. The presence of the construction workforce at subproject sites and the opening up of isolated areas may expose the local population to STI/HIV/AIDS risk. The proposed Project will finance training and awareness campaigns in each province and require contractors, through civil works contracts, to take preventive measures to mitigate the risk. Other than the STI/HIV/AIDS issue, no adverse impacts on vulnerable groups and indigenous people were identified.

D. Environmental Impacts

62. The proposed subprojects under the Project have been categorized as environmental category B project in accordance with the ADB *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003). Environmental assessment has been carried out for all 11 road sections. IEE reports and EMMP have been prepared and agreed with the Government. A summary initial environmental examination is in Appendix 10.

63. Various consultations, a review of documents, and field assessments of the proposed road sections lead to the conclusion that significant and/or irreversible impacts are unlikely and that the 11 road sections comply with ADB's *Environment Policy*. In particular, the proposed road sections are not located in environmentally sensitive or conservation areas. Road improvement will not increase logging or hunting and are strongly supported and requested by local communities. No significant cumulative impacts are identified. Moreover, the proposed roadwork is limited to rehabilitating or upgrading existing roads and can generally be carried out within the existing road reserve.

64. As summarized in EMMP, which will be part of the contractors' subcontract, all potential environmental concerns can properly be mitigated and minimized to acceptable levels. As such, the scope of the rehabilitation and upgrading of the proposed road sections and their anticipated environmental impacts do not require further study. The supporting EMMP will provide sufficient guidance for HRMG staff to successfully monitor and report on the Project's environmental compliance.

E. Project Risks

65. The subprojects to be financed under the Project are subject to the usual risks of transport projects. These include project start-up delay, road sustainability, environmental impacts, and STI/HIV/AIDS exposure. The design of the Project has taken into account these risks and includes mitigating measures. To minimize project implementation delay, all 11 road subprojects have been screened, and due diligence has been completed. The existing institutional arrangements, including consulting services for project implementation, will be maintained to ensure continuity and avoid disruptions. Detailed engineering design and the preparation of bidding documents are under way and will be finalized during project implementation. Procurement of civil works will follow a single-stage one-envelope bidding procedure with post-qualification in order to expedite the procurement bidding process. With all the measures proposed above, completion of the Project will likely be by the end of 2009, as indicated in the detailed implementation schedule.

66. The issue of road sustainability has been extensively discussed by ADB missions and the Government during project processing and has been addressed in the Project. HRMG will implement a contracting-out system to engage local communities or contractors to provide routine and periodic maintenance for ADB-financed roads so that the life of the completed roads can be extended. Road maintenance will be contracted out starting in 2007. An assurance is included to ensure that the Government will maintain the road sections funded by Loan 1709-PNG and the supplementary loans.

67. Environmental impacts during construction will be mitigated by DOW's implementing EMMP, which include the obligation to incorporate mitigation measures into civil works contracts, and by monitoring these contracts. Monitoring results will be reflected in project progress reports. The impact of STI/HIV/AIDS will be mitigated by incorporating appropriate conditions in civil works contracts that require contractors to adopt preventive measures, supplemented by training and awareness campaigns financed by the Project. The preventive measures undertaken under each road section will be monitored and reflected in the project progress reports, which will be submitted to the National AIDS Council and the Country Coordinating Mechanism. Assurance has also been given by the Government with respect to health standards.

V. ASSURANCES

A. Specific Assurances

68. In addition to the standard assurances, the Government and DOW have given the following assurances, which are incorporated in the legal documents:

- (i) **Project executing agency.** DOW will continue to act as the Project Executing Agency as set forth in Loan 1709-PNG responsible for overall execution and coordination of the Project.
- (ii) **Project implementation unit.** HRMG, assisted by a team of consultants engaged under the Project, will continue to act as the Project Implementation Unit. HRMG will remain headed by a project director, who will be assisted by a team of qualified technical, financial, and support staff. The Government will continue to provide HRMG with adequate office space and support services in a form satisfactory to ADB throughout the implementation period.
- (iii) **Project steering committee (PSC).** The PSC set forth in Loan 1709-PNG will continue to act as the Project Steering Committee to ensure close interagency coordination and monitor the implementation of the Project. The PSC will be chaired by a provincial administrator and will be composed of five provincial administrators, five Government agencies, and two representatives from the private sector. The Government, through DOW, will ensure that PSC will meet at least quarterly to review the progress of implementation and provide support and guidance on project implementation, as necessary.
- (iv) **Counterpart funding.** The Government will provide, on a timely basis, all funds and resources necessary for upgrading, rehabilitation, maintenance, and management of the project facilities financed under the Project.
- (v) **Construction quality.** The Government, through DOW, will ensure that the project roads are rehabilitated and upgraded according to technical specifications of the design. In addition, the Government, through DOW, will ensure that construction supervision, quality control, and project management are performed according to internationally accepted standards.
- (vi) **Road safety.** The Government will ensure that appropriate road safety facilities such as pavement markings, warning signs, traffic signs and signals, and hazard barriers are installed during project implementation and after completion and that adequate training on road safety is provided to local communities by HRMG.
- (vii) **Road maintenance.** The Government, through DOW, will ensure that (a) sufficient funds are allocated for the maintenance of the roads financed under the Project and to keep the Road Asset Management System operational, and (b) HRMG contracts out routine and periodic road maintenance with local communities and other contractors.

- (viii) **National road authority.** The Government will ensure full operation of the National Road Authority by appointing the chief executive officer and other critical staff and delineating responsibilities between DOW and the National Road Authority.
- (ix) **Labor.** The Government, through DOW, will ensure that civil works contractors comply with all applicable labor laws and regulations as well as international treaties; do not employ child or forced labor for road reconstruction, rehabilitation, and maintenance; provide equal opportunities for women in road reconstruction, rehabilitation, and maintenance activities; and promptly pay equal wages to men and women for work of equal value. DOW will ensure that specific provisions to this effect are included in bidding documents and civil works contracts and that compliance is monitored on an ongoing basis.
- (x) **Gender and development.** The Government will ensure that the Project is implemented according to ADB's policy on gender and development.¹⁶ The Government, through HRMG, will (a) encourage local contractors to recruit women in the reconstruction, rehabilitation, and maintenance of the roads financed; and (b) provide safe working conditions for both male and female workers. The Government, through HRMG, will ensure that the above requirements are included in the bidding documents and civil works contracts.
- (xi) **Health standards.** The Government, through HRMG, will ensure that all civil works contractors engaged under the Project will participate in the community-based training programs with respect to road safety and STI/HIV/AIDS prevention (in consultation with Provincial AIDS Council and the Health Administration) to be funded under the Project along the prioritized road sections. In addition, HRMG shall ensure that similar information on the risk of transmission of STI/HIV/AIDS is also disseminated to local communities in the corridor of influence, in coordination with national agencies working on this issue. Specific provisions to this effect will be included in civil works contracts, and compliance will be strictly monitored by HRMG through the engagement of a qualified international consultant.
- (xii) **Resettlement.** The Government and DOW will ensure that all project rehabilitation and upgraded works are undertaken within the existing right of way. In the event of any unforeseen resettlement, the Government will inform ADB and prepare and implement a resettlement plan according to the relevant local laws and regulations, and to ADB's *Policy on Involuntary Resettlement* (1995). The Government will allocate the adequate resources to prepare and implement the resettlement plan, and supervise and monitor its implementation. The Government, through DOW, will ensure that land acquisition and/or resettlement will not commence before the resettlement plan is reviewed and approved by ADB, and that civil works will not start before the resettlement plan is approved by ADB.
- (xiii) **Environment.** The Government, through HRMG, will ensure that (a) the project design, construction, and operations comply with applicable domestic laws, regulations, and standards and ADB's *Environment Policy*; (b) all environmental mitigation measures, institutional requirements, and monitoring plans specified in the IEE are complied with; (c) the mitigation measures are updated during the detailed design; (d) all the above requirements are incorporated in the bidding documents and civil works contracts to ensure compliance; and (e) environmental compliance monitoring by DOW and HRMG is undertaken in accordance with all applicable laws and regulations of the Government and ADB's *Environment Policy* and reflected in the project progress reports and project completion report.

¹⁶ ADB. 2003. Policy Paper on *Gender and Development*. Manila.

- (xiv) **Governance and anticorruption.** The Government and DOW will follow ADB's policy on anticorruption.¹⁷ The Government and DOW acknowledge that ADB, consistent with its commitment to good governance, accountability, and transparency, reserves the right to investigate directly, or through its agents, any alleged corrupt, fraudulent, collusive or coercive practices relating to the Project. All costs related to such investigations shall be borne by the Project. The Government, through DOW, will ensure that the following anticorruption measures are undertaken during project implementation: (i) anticorruption provisions acceptable to ADB will be included in all bidding documents and contracts, in particular a provision specifying the right of ADB to audit and examine the records and accounts of the EA and all contractors, suppliers, consultants and other service providers as they relate to the Project; and (ii) the project supervision consultant will verify the contractors' payment claims in accordance with the contract specifications.
- (xv) **Project performance monitoring and evaluation.** The Government, through HRMG, assisted by consultants engaged under the Project and the HRMG community relations officer, will monitor and evaluate the Project and subproject impacts to ensure that the project facilities are managed effectively and the project benefits maximized. The Government, through HRMG, will discuss and agree with ADB the indicators and baseline data prepared by the consultants prior to the commencement of civil works financed by the supplementary loans, and ensure that the consultants will monitor and compare the data during the project implementation and at project completion, and submit monitoring and evaluation reports to ADB 1 month after the completion of their fieldwork. To the extent possible, the indicators and baseline data will make full use of gender-disaggregated data and information. The Government will collect the data agreed with ADB at the inception, project completion, and 3 years after project completion.
- (xvi) **Project auditing.** The Government will cause DOW to (a) undertake timely audit of project accounts according to sound auditing standards by an external auditor acceptable to ADB and (b) submit to ADB audited project accounts and related financial statements within 6 months of the end of each fiscal year during implementation.
- (xvii) **Subproject Progress Reports.** During the implementation period, the Government, through HRMG, will submit to ADB quarterly subproject progress report and subproject completion report within 3 months of subproject completion. The subproject progress reports will cover civil works progress, environmental, institutional, socioeconomic, financial, and other relevant aspects that may have an impact on the performance of the subproject and its continuing activity.

B. Condition for Loan Effectiveness

- 69. The OCR and the ADF loan shall be declared effective at the same time.

VI. RECOMMENDATION

- 70. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and, acting in the absence of the President, under the provisions of Article 35.1 of the Articles of Agreement of ADB, I recommend that the Board approve

¹⁷ ADB. 1998. *Anticorruption*. Manila.

- (i) the supplementary loan of \$35 million to Papua New Guinea for the Road Maintenance and Upgrading (Sector) Project from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's LIBOR-based lending facility; a term of 24 years, including a grace of period of 4 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan Agreement presented to the Board; and
- (ii) the supplementary loan in various currencies equivalent to Special Drawing Rights 12,075,000 to Papua New Guinea for the Road Maintenance and Upgrading (Sector) Project from ADB's Special Funds resources with an interest charge at the rate of 1.0% per annum during the grace period and 1.5% per annum thereafter; a term of 32 years, including a grace period of 8 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan Agreement presented to the Board.

Liqun Jin
Vice President

7 June 2006

REVISED DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
Impact Increased economic activity and social improvement	Increased trading activity for villagers in the corridors of influence Increased freight traffic Increased visits to health facilities in major town centers by villagers in the corridors of influence, particularly by women Improved income and health indicators Increased school enrollment	Government reports Socioeconomic monitoring reports	Assumptions Favorable weather conditions Favorable international commodity prices Agricultural services delivered Highlands Highway rehabilitated and maintained Adequate health and education services in city centers
Outcome Improved rural access to market centers	Growth in informal transport services Change in farm gate prices Reduction in travel time Change in livelihood patterns	Socioeconomic monitoring reports	Assumption Local business sector and communities respond to improved road conditions
Outputs 1. Improved road conditions for villagers and businessmen to access market opportunities, social services, and imported daily necessities 2. Baseline data and performance monitoring and evaluation system for the Project established 3. Socioeconomic impacts of the Project assessed	1.1 Reduced roughness on 270 kilometer (km) roads to 6 m/km by end 2009 1.2 Reduced vehicle operating cost starting in 2010 1.3 Increased frequency of public transport services 1.4 Imported foodstuffs and household consumables more reliably available 2.1 Consultant recruited and fielded from 2007 to 2010 2.2 Baseline data for the 11 roads	Road condition survey Sample surveys of vehicle operators/owners Project progress and completion reports Consultants' reports	Assumptions No interruptions from force majeure Timely provision of counterpart funds Crime under control Low staff turnover in international consulting team and Highlands Region Maintenance Group

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
	3.1 Socioeconomic impact assessment results		
Activities with Milestones 1. Prepare technical design and bidding documents, undertake bidding processes, and award contracts from April 2007. 2. Commence civil works in the second quarter of 2007. 3. Upgrade and rehabilitate 270 km of roads by December 2009. 4. Provide training to local counterpart staff on road design, preparation of bidding documents, contract administration, construction supervision, and quality control from January 2006 to December 2009. 5. Monitor performance and socioeconomic impacts of the Project.			Inputs ADB: \$18 million ADF loan \$35 million OCR loan; <ul style="list-style-type: none"> • Civil works (\$42.58 million) • Consulting services (\$3.21 million) • Contingencies (\$7.21 million) Government: \$25.07 million <ul style="list-style-type: none"> • Civil Works • Consulting services • Contingencies • Financial charges on ADB loans Beneficiaries <ul style="list-style-type: none"> • Government, private sector, villagers, vehicle operators and/or owners, and international and domestic nongovernment organizations

ADB = Asian Development Bank, ADF = Asian Development Fund, OCR = ordinary capital resources.

LESSONS LEARNED

1. The Road Maintenance and Upgrading (Sector) Project¹ (Loan 1709-PNG) was approved on 16 November 1999 and became effective on 15 February 2000. The main component of Loan 1709-PNG was to upgrade 220 km of roads and rehabilitate 450 km. To date, the Asian Development Bank (ADB) has approved 19 road subprojects involving 21 contract packages for upgrading 249.61 km of roads and rehabilitating 211.41 km. Thirteen of the subprojects are financed from Loan 1709-PNG, and six of them are financed entirely by the Government. As of May 2006, four subprojects involving 39.8 km of roads had been fully completed, and seven contract packages had been awarded. Civil works of five subprojects were in progress (two of which are 90% completed), one contract awaited signing, and the remaining nine were at various stages of tendering.
2. Project implementation has three stages: (i) road subproject identification and approval, (ii) procurement of civil works, and (ii) construction.
3. At the first stage, establishing the project implementation unit proved difficult because of the challenging work environment in Papua New Guinea (PNG) and the scarcity of qualified and available human resources. An international consulting firm engaged in November 2000 to strengthen project implementation and maintenance management was mobilized in January 2001. Frequent withdrawal and replacement of the consultants, including the chief implementation advisor, occurred due to (i) the long visa application process, (ii) concerns over security and living conditions in the country, and (iii) health and family reasons. The implementation consulting team was fully mobilized in August 2002 and has been stable ever since. In addition, the Government required a long time to appoint qualified fulltime staff to handle the key positions in the Highlands Region Maintenance Group and provide office space. Another difficulty was identifying the road subprojects and obtaining ADB approval. Under the sector lending approach, the borrower or the executing agency (EA) is primarily responsible for identifying, prioritizing, formulating, appraising, approving, and implementing subprojects in accordance with technical, financial, and economic appraisal criteria, including social and environmental criteria, mutually agreed between ADB and the borrower/EA.² Between 2001 and 2005, the Government sent about 45 subproject proposals, and ADB approved 19. Most of the subprojects were approved by ADB in 2004 (nine approvals) and 2005 (five). From 2000 to 2003, only five road subprojects had been approved by ADB, and 2003 saw no approvals.
4. In the second stage, the Project experienced delays caused by the time-consuming two-stage international competitive bidding process and the slowness of the Government's approval procedures. Of the 13 ADB-financed civil works contracts, 11 went through a prequalification stage. The average duration for prequalification was about 9 months, and from prequalification or post-qualification to contract award, the average duration for the 10 contracts was 20.5 months. Pursuant to the Government's rules, any contract valued above K10 million (equivalent to \$3.2 million) requires the approval of the National Executive Council (the national Cabinet) upon recommendation of the Central Supply and Tenders Board. This process caused delay in awarding contracts. Under Loan 1709-PNG, securing Government approval of contract awards has taken 2 to 9 months.

¹ ADB. 1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan for Papua New Guinea on Road Maintenance and Upgrading (Sector) Project*. Manila. (Loan 1709-PNG, approved on 16 November).

² ADB. 2003. Operations Manual. Section D3/BP: Sector Lending. Manila (29 October 2003).

5. In the construction stage, road upgrading and rehabilitation have suffered from the difficult law and order situation in the Highlands, particularly in Southern Highlands, Enga, and Western Highlands provinces. For example, shooting and killing in Western Highlands Province in November 2005 forced the contractors to stop civil works for 3 weeks.

6. Several lessons can be drawn. First, for a fragile state such as PNG, ADB could have supported the Government more in preparing the subprojects by helping it to (i) prioritize some investments; (ii) conduct technical feasibility studies and financial, environmental, and social due diligence; and (iii) prepare the technical design and bidding documents. Secondly, ADB should have supported the Government in mobilizing the core team for project implementation at an earlier stage to minimize the delay in starting the project. Thirdly, procurement of civil works could have followed a one-stage bidding process with post-qualification, as the construction sector in PNG has limited competition. Lastly, ADB needs to strengthen its policy dialogue with the Government, aiming to simplify the latter's approval process for awarding contracts.

7. Although the Project experienced substantial delays in implementation start-up, it is noteworthy that ADB is a major actor in the Highlands, playing a key role in promoting economic and social development by restoring and maintaining the road system. Recently, a large ground-breaking ceremony for the Mendi–Nipa road section, financed by Loan 1709-PNG, was held in Southern Highlands Province. The provincial governor chaired the ceremony, attended by the minister and secretary of works, vice minister of finance and treasury, acting attorney general, ADB representative, and an unprecedented crowd of about 70,000 villagers. Popular and governmental support for the road was impressive and encouraging.

8. Furthermore, the Project has gained momentum since 2004 and is progressing satisfactorily, with major contracts awarded and civil works in progress. The turnaround occurred in November 2003, when the ADB Review Mission agreed with DOW on steps to take to speed the approval of subproject proposals and procurement. As a result, nine road subprojects were approved in 2004, and five in 2005. Two contracts were awarded in 2004, three in 2005, and two in 2006. Impressed by the solid progress of the Project, the Government has committed K91 million to fully finance five other road subprojects in the Highlands region.

9. Supplementary financing is an efficient means to capture this momentum to increase local road connectivity and so support the Government's development strategy of economic growth, income generation, and poverty reduction. It builds on efforts already made by the Government and international consulting team, and on the efficiency of the current, experienced project implementation unit. It streamlines ADB processing without compromising its environmental, resettlement, and social safeguard policies.

10. The design of supplementary financing takes into account the lessons learned from Loan 1709-PNG. From 45 subproject pre-investment studies, 11 road subprojects have been prioritized and scrutinized, and will be submitted for ADB one-time approval. Due diligence in line with ADB environmental and social safeguard policies has been completed for these subprojects, and economic justification for each of them provided. Subproject technical design and the preparation of bidding documents are already making good progress. Cost estimates were based on the characteristics of the selected roads, types of intervention, quantities required, and realistic unit costs. Procurement will follow a one-stage one-envelope procedure with post-qualification. An experienced project implementation office is already in place and will implement the Project. These measures promise to improve project performance substantially.

COST ESTIMATES AND FINANCING PLAN

Item	Costs				Financing					
	A Foreign Exchange (K m)	B Foreign Exchange (\$ m)	C Local Currency (K m)	D Local Currency (\$ m)	E Total (E=A+C) (K m)	F Total (F=B+D) (\$ m)	Govt. (K m)	Govt. (\$ m)	ADB (K m)	ADB (\$ m)
A. Base Cost^a										
1. Civil Works										
a. Okapa–Raipinka	12.89	4.16	7.57	2.44	20.46	6.60	4.09	1.32	16.37	5.28
b. Goroka–Lahame	6.31	2.03	3.71	1.20	10.02	3.23	2.00	0.64	8.02	2.59
c. Kamaliki–Move	10.74	3.46	6.31	2.04	17.05	5.50	3.41	1.11	13.64	4.39
d. Kindeng–Kondopina	7.48	2.41	4.39	1.42	11.87	3.83	2.37	0.77	9.50	3.06
e. Banz–Dona	11.28	3.64	6.63	2.14	17.91	5.78	3.58	1.15	14.33	4.63
f. Gewa–Gembogl	6.68	2.15	3.92	1.27	10.60	3.42	2.12	0.68	8.48	2.74
g. Kerowagi–Dona	7.96	2.56	4.67	1.51	12.63	4.07	2.53	0.82	10.10	3.25
h. Korinige–Kerowagi	2.14	0.69	1.26	0.41	3.40	1.10	0.68	0.22	2.72	0.88
i. Warumanda–Laiagam	18.36	5.92	10.78	3.48	29.14	9.40	5.83	1.88	23.31	7.52
j. Ialibu–Kagua	12.23	3.94	7.19	2.32	19.42	6.26	3.88	1.26	15.54	5.00
k. Ialibu–Pangia	7.94	2.56	4.66	1.50	12.60	4.06	2.52	0.82	10.08	3.24
Subtotal (A)	104.01	33.52	61.09	19.73	165.10	53.25	33.01	10.67	132.09	42.58
B. Consulting Services										
1. Engineering design, preconstruction activities, construction supervision, performance monitoring and evaluation, and training on STI/HIV/AIDS Prevention	9.95	3.21	0.00	0.00	9.95	3.21	0.00	0.00	9.95	3.21
2. Project design	0.00	0.00	8.26	2.66	8.26	2.66	8.26	2.66	0.00	0.00
3. Construction supervision	0.00	0.00	13.21	4.26	13.21	4.26	13.21	4.26	0.00	0.00
4. Financial auditing	0.00	0.00	0.20	0.06	0.20	0.06	0.20	0.06	0.00	0.00
5. Road maintenance, safety, and HIV/AIDS prevention	0.00	0.00	0.75	0.24	0.75	0.24	0.75	0.24	0.00	0.00
Subtotal (B)	9.95	3.21	22.42	7.22	32.37	10.43	22.42	7.22	9.95	3.21
C. Contingencies										
1. Physical contingencies ^b	10.40	3.35	6.11	1.97	16.51	5.32	4.59	1.47	11.92	3.85
2. Price contingencies ^c	6.32	2.04	8.15	2.63	14.47	4.67	4.05	1.31	10.42	3.36
Subtotal (C)	16.72	5.39	14.26	4.60	30.98	9.99	8.64	2.78	22.34	7.21
D. IDC and Commitment Charge	13.64	4.40	0.00	0.00	13.64	4.40	13.64	4.40	0.00	0.00
Total	144.32	46.52	97.77	31.55	242.09	78.07	77.71	25.07	164.38	53.00

ADB = Asian Development Bank, IDC = interest during construction, govt. = government, m = million.

Note: Numbers may not sum precisely due to rounding.

^a At 2006 prices, including taxes and duties of approximately 14% and the cost of environmental mitigation measures.

^b Computed at 10% of base cost for civil works.

^c Computed using ADB cost escalation factors. For foreign exchange cost, 2.8% in 2006 and 1.9% in 2007 and onwards.
For local currency cost, 4.8% in 2006, 4.9% in 2007, 5.0% in 2008, and 5.1% in 2009.

Source: Asian Development Bank estimates.

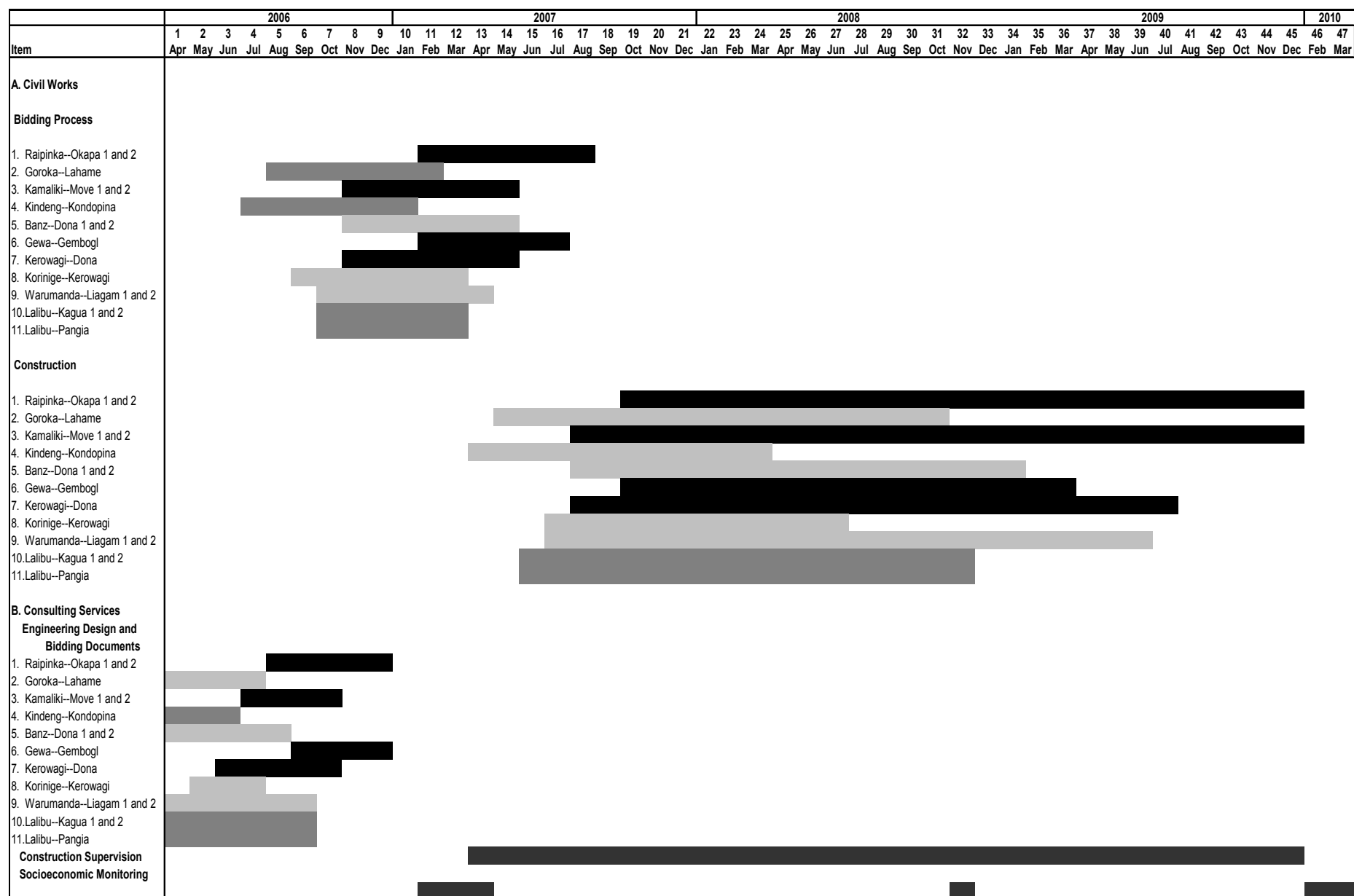
ADF AND OCR LOANS FINANCING ARRANGEMENT
(\$ million)

Item	Loan Allocation	ADF	OCR	ADF Financing Percentage	OCR Financing Percentage
1. Civil Works	42.58	14.46	28.12	27	53
2. Consulting Services	3.21	1.09	2.12	34	66
3. Contingencies	7.21	2.45	4.76		
Total	53.00	18.00	35.00		

ADF = Asian Development Fund, OCR = ordinary capital resources

Sources: Asian Development Bank estimates.

IMPLEMENTATION SCHEDULE



Source: Asian Development Bank.

PROCUREMENT PLAN

Project Information	The supplementary financing will finance 11 road subprojects with 16 contract packages, and related consulting services for detailed engineering design, preconstruction activities, construction supervision, performance monitoring and evaluation, and training on STI/HIV/AIDS prevention
Country	Papua New Guinea
Name of Borrower	Papua New Guinea
Project Name	Road Maintenance and Upgrading Project (Supplementary Financing)
Loan or TA Reference	
Date of Effectiveness	
Amount US\$	\$53 million
Of which Committed, US\$	
Executing Agency	Department of Works
Approval Date of Original Procurement Plan	June 2006
Approval of most recent Procurement Plan	June 2006
Publication for Local Advertisements	June 2006
Period Covered by this Plan	July 2006 to August 2007

Procurement Thresholds, Goods and Related Services, Works and Supply and Install

Procurement Method	To be used above
ICB Works	More than \$3 million
ICB Goods	Not applicable
NCB Works	Less than \$3 million
NCB Goods	Not applicable
Shopping Works	Not applicable
Shopping Goods	Not applicable
Exceptional Methods	
If limited international bidding, direct contracting, force account or community participation in procurement will be employed on the project, list them here and described the circumstances under which they may be employed.	Not applicable

Procurement Thresholds, Consultants Services

Procurement Method	To be used above (value \$)
Quality-and Cost-Based Selection (QCBS)	Not applicable
Consultants Qualifications Selection (CQS)	Not applicable
Least Cost Selection (LCS)	Not applicable
Exceptional Methods	\$3.21 million
If quality-based selection, fixed budget selection, single source selection or selection of individual consultants that will be employed on the project, list them here and described the circumstances under which they may be employed.	Single source selection, because of the natural continuation of the previous work.

List of Contract Packages in Excess of \$100,000, Goods, Works and Consulting Services

Location	Contract Description	Estimated Cost (\$ million)	Procurement Method^a	Expected Date of Advertisement	Prior Review Y/N
I. Civil Works					
1. Raipinka-Okapa	Raipinka -Okapa backroad junction	3.42	ICB	June 2006	Yes
	Okapa backroad junction-Okapa station	3.18	ICB	June 2006	Yes
2. Goroka-Lahame	Goroka-Lahame	3.23	ICB	June 2006	Yes
3. Kamaliki-Move	Kamaliki-Bekuvia bridge	2.74	NCB	June 2006	No
	Bekuvia bridge-Move	2.76	NCB	June 2006	No
4. Kindeng-Kondopina	Kindeng-Kondopina	3.83	ICB	June 2006	Yes
5. Banz-Dona	Banz Town-Karameng,	2.73	NCB	June 2006	No
	Karameng-Dona	3.05	ICB	June 2006	Yes
6. Gewa-Gembogl	Gewa-Gembogl	3.42	ICB	June 2006	Yes
7. Kerowagi-Dona	Kerowagi-Dona	4.07	ICB	June 2006	Yes
8. Korinige-Kerowagi	Korinige-Kerowagi	1.10	NCB	June 2006	No
9. Warumanda-Laiagam	Warumanda-Lame Bridge	3.10	ICB	June 2006	Yes
	Lame Bridge-Laiagam	6.30	ICB	June 2006	Yes
10. Ialibu-Kagua	Ialibu-Seven Coners Village	3.83	ICB	June 2006	Yes
	Seven Corners Village-Kagua	2.44	NCB	June 2006	Yes
11. Ialibu-Pangia	Ialibu-Pangia	4.06	ICB	June 2006	Yes
II. Consulting Services^b					
A. Project engineering design, preconstruction activities, construction supervision, performance monitoring and evaluation, and training on STI/HIV/AIDS prevention		3.21	SSS	RFP issued by November 2006	

ICB = international competitive bidding, NCB = national competitive bidding, SSS = single source selection, RFP = request for proposal.

Source: Asian Development Bank estimates.

^a For ICB contracts, 3 copies of the invitations for bids and all related bidding documents should be submitted to the Asian Development Bank (ADB) for approval 21 days prior to the proposed date for issuing of the bidding documents. The Bid evaluation reports and proposals for contract award should be submitted to ADB for review and approval 30 days before the expiration of the bid validity. Domestic preference will apply to ICB contracts only. All contracts will follow one-stage one-envelope bidding procedure with post qualification. The draft bidding documents and bid evaluation report of the first NCB contract package should be submitted for ADB prior approval. Subject to satisfactory performance of the first NCB contract package, the draft bidding documents and bid evaluation reports of the rest of NCB contract packages will be reviewed by ADB on a post facto basis.

^b Request for Proposal for biodata technical and financial proposals should be issued. Evaluation report and draft negotiated contract and minutes should be submitted for ADB's approval.

OUTLINE TERMS OF REFERENCE FOR INTERNATIONAL CONSULTING SERVICES

1. A total of 132 person-months of international consulting services and 450 person-months of domestic consulting services will be required for detailed engineering design, preconstruction activities, construction supervision, environmental monitoring, financial auditing, project performance monitoring and evaluation, and training on road maintenance and safety and STI/HIV/AIDS prevention. The consultant will assist and support the Department of Works (DOW), providing guidance and advise on the (i) detailed design and preconstruction activities, including the preparation of tender documents, tender process, evaluation of bids, and contract awards, and (ii) implementation of civil works for the selected subproject road sections in the provinces of Eastern Highlands, Enga, Chimbu, Southern Highlands, and Western Highlands. The Highlands Region Maintenance Group (HRMG) field project manager will be fully responsible as the engineer, while the provincial work managers will act as the engineer's representatives on the Project. The consultant will help HRMG staff prepare an environmental impact management plan and ensure that the contractor adheres to all aspects of environmental protection and undertakes the action required under the plan.

2. The consultant will compile benchmark project performance baseline data and provide practical on-the-job training to DOW technical field staff and staff members of the provincial administrations when undertaking the task.

A. Scope of the Work

1. Road Upgrading

3. The responsibilities of the consultant will include the following:

- (i) Assist, advise, and provide guidance in undertaking a topographic survey that encompasses the full extent of the road, bridge sites, and drainage structures in compliance with international and DOW standards. Assist in preparing plans of all survey work for compiling benchmark information and descriptions of features.
- (ii) Provide assistance in carrying out geotechnical tests of pavement strength, thickness, and other characteristics. The frequency of test locations shall be sufficient to determine base and sub-base requirements.
- (iii) Identify and test, using DOW facilities and personnel, material quarry sites to determine compliance with proposed material specifications. Estimate the quantity of material complying with the relevant code that is available from each site. Identify sufficient sites to meet the requirements of the Project. Identify the extent of any construction activities required to excavate, treat (if necessary), and load the material.
- (iv) Prepare road design criteria and design speed in conformity with the scope of works recommended in the approved feasibility study and the current version of the Papua New Guinea (PNG) Road Design Manual, TRL Road Note 31, and PNG Drainage Design Manual. While providing for safe travel, the practical design speed should be selected to minimize land acquisition requirements.
- (v) Help, advise, and provide guidance on preparing preliminary designs of road cross-sections, geometric alignment (horizontal and vertical), pavement type and thickness, road furniture, and drainage structures.
- (vi) Help and advise on carrying out preliminary bridge design in accordance with the PNG Bridge Design Manual, stressing the need for compatibility with the road alignment and the findings of the approved economic feasibility study.

- (vii) Help and advise on carrying out bridge foundation investigations based on the approved preliminary design.
- (viii) Prepare construction contract packaging to ensure that the Government receives value for money, and facilitate construction activities.
- (ix) Help and advise on preparing detailed design drawings of all construction items, including longitudinal sections in the minimum scales of horizontal 1:2000 and vertical 1:200, and cross-sections minimum horizontal scale of 1:100. All drainage structures will be detailed in plan, longitudinal, and sections.
- (x) Prepare work quality and materials specifications based on current DOW workmanship and materials specifications with approved modifications.
- (xi) Help and advise on preparing an environmental impact management plan in accordance with the Asian Development Bank (ADB) *Environmental Guidelines for Selected Infrastructure Projects (Highways and Roads)* and international standards to identify any unacceptable environmental impacts during construction and measures to mitigate them.
- (xii) Assist in updating subproject-specific environmental management and monitoring plans at engineering design stage, and incorporate them in bidding documents and civil works contracts. Assist DOW in monitoring the updates and implementing the environmental management plans (EMPs), and prepare environmental reports.
- (xiii) Prepare bidding documents in compliance with ADB's *Procurement Guidelines*. Submit these documents to DOW and ADB for approval as soon as they are completed. Provide technical support to DOW during the tendering and contract negotiation stages. Participate in bid evaluation and contract negotiations. Prepare final contract documents based on the results of the contract negotiations.

2. Road Rehabilitation

4. The consultant's responsibilities will include the following:

- (i) Help and advise on carrying out geotechnical tests of pavement strength, thickness, and other characteristics. The frequency of test locations will be sufficient to determine base and sub-base requirements.
- (ii) Identify and test, using DOW facilities and personnel, material borrow areas to determine their compliance with proposed material specifications. Estimate the quantity of material that complies with the relevant code available from each site. Identify sufficient sites to meet the requirements of the Project. Identify the extent of any construction activities required to excavate, treat (if necessary), and load the material.
- (iii) Prepare design criteria in conformity with the scope of works recommended in the approved feasibility study and the current version of the PNG Road Design Manual, TRL Road Note 31, and PNG Drainage Design Manual.
- (iv) Help and advise on preparing preliminary designs of road cross-sections, pavement types and thickness, road furniture, and drainage structures.
- (v) Prepare construction contract packaging to ensure that the Government receives value for money, and facilitate construction activities.
- (vi) Help and advise on preparing detailed design information of the final cross-section, minimum depth, and type of pavement overlay. All drainage structures will be detailed in plan, longitudinal, and sections.
- (vii) Prepare work quality and materials specifications based on current DOW work quality and materials specifications with approved modifications.

- (viii) Prepare bidding documents in compliance with ADB's *Procurement Guidelines*. Submit these documents to DOW and ADB for approval as soon as they are completed. Provide technical support to DOW during the tendering and contract negotiation stages. Participate in bid evaluation and contract negotiations. Prepare final contract documents based on the results of contract negotiations.
- (ix) Assist in updating subproject specific environmental management and monitoring plans at engineering design stage, and incorporate them in bidding documents and civil works contracts. Assist DOW in monitoring the updates and implementing the EMPs, and prepare environmental reports.

3. Construction Supervision

5. The responsibilities of the consultant will include the following:

- (i) Help and advise on providing effective and regular supervision of the works. Supervise quality control tests to ensure that the works are executed in accordance with established standards, criteria, specifications, procedures, and approved design and environmental aspects in accordance with the standards of the Fédération International des Ingenieurs-Conseil. Ensure implementation of the civil works in compliance with the prepared environmental management and monitoring plan and the construction schedule.
- (ii) Regularly inspect the contractor's construction requirements, installations, housing, medical facilities, etc., to ensure that they are adequate and in accordance with the terms and conditions specified in the contract for civil works. Minimize disturbance to the local communities and economy.
- (iii) Help and advise on maintaining a permanent record of all measurements for the work quantities to be paid for and the results of all tests carried out for monitoring the quality of civil works.
- (iv) Help and advise on preparing a bill of quantities and make recommendations, for the engineer's consideration, on certifying all payments to be made to the contractor.
- (v) Liaise with and inform the engineer of problems arising with the implementation of civil works and recommend possible solutions.
- (vi) Revise plans and specifications as necessary, prepare variation orders, and assist the engineer in negotiating with the contractor implementation of these changes (if they involve additional cost, ADB will be consulted before implementation).
- (vii) Evaluate and make recommendations to the engineer on the contractor's claims, disputes, contract time extensions, and other changes outside the scope of the contract.
- (viii) Help and advise on preparing monthly contract payments estimates and certificates for payment, including updated cost estimates for construction and supervision.
- (ix) Provide timely assistance to the contractor in all matters related to interpreting contract documents, ground survey controls, quality control testing, and other matters relating to the contract under the Project.
- (x) Assist DOW in preparing a project completion report in a manner satisfactory to the Government and ADB, including as-built drawings, after completion of the works.
- (xi) Incorporate on-the-job training for technical field staff of DOW and provincial administrations when undertaking the project tasks.

4. Socioeconomic Monitoring and Evaluation

6. The consultant will have the following responsibilities:
 - (i) Review project documents, including the report and recommendation of the President, legal documents, and technical assistance reports, particularly the initial social assessment for the Road Maintenance and Upgrading (Sector) Project covering five Highlands provinces.
 - (ii) Establish, before April 2007, a set of project performance indicators and sex-disaggregated baseline data for road subprojects whose civil works have not commenced, considering the project goal, outcome, and outputs. Indicators may include (a) economic activities and income level in the project area; (b) industrial and agricultural outputs; (c) transport costs and time; (d) transport services and transport charges; (e) accident rates; (f) level of social services, including school enrollment and infant mortality; (g) access to HIV/AIDS information and services; and (h) jobs created by road rehabilitation. Employment impact indicators will include information about unskilled, poor, and female laborers.
 - (iii) Review and update the baseline data during the upgrading and rehabilitation period. Analyze the data and evaluate the project impact.
 - (iv) Review and update the baseline data at project completion. Analyze the data and evaluate the project impact.
 - (v) Monitor and evaluate the performance of ongoing and completed road sections, and prepare subproject completion reports.
 - (vi) Assess the overall impact of the Project. Prepare monitoring and evaluation reports. Submit the reports to the Government and ADB 1 month after the fieldwork.
 - (vii) Provide training to the HRMG community relations officer and other counterpart staff, and ensure knowledge transfer.

5. Training on Road Maintenance, Road Safety, and STI/HIV/AIDS Prevention

7. Through the HRMG community relations officer, help DOW ensure the timely and effective organization of the following activities: (i) community-based routine maintenance of selected roads completed under Loan 1709-PNG and supplementary loans; (ii) community-based training on road maintenance and road safety under the guidance of the Provincial Works Administration; and (iii) prevention of sexually transmitted infections (STI), including HIV/AIDS, along the prioritized road sections in consultation with Provincial AIDS Council and Health Administration.

B. Preparation of Reports

8. Assist DOW and HRMG staff in preparing quarterly project progress reports and the project completion report.

1. Quarterly Progress Reports

9. The consultant will help the engineer's representative submit quarterly progress reports. The reports will summarize the (i) progress of civil works, (ii) results of environmental and social monitoring, (iii) STI/HIV/AIDS prevention actions undertaken under each road section, (iv) issues and proposed solutions, and (v) an outline of the work to be performed during the next reporting period. The consultant will train DOW provincial staff and staff of the provincial authorities on their reporting responsibilities. The quarterly progress reports shall be submitted

to the National AIDS Council, the Country Coordinating Mechanism, and relevant government agencies mandated for environmental protection.

2. Construction Completion Report

10. Help and advise on preparing subproject construction completion reports, including as-built drawings (one copy only, which will be submitted to DOW), noteworthy events in the course of the subproject, the performance of the contractor, the operation of the subproject, and the actual cost.

3. Project Completion Report

11. Help and advise on preparing a project completion report when project subprojects are substantially completed. The report should describe the project and its implementation and evaluate ADB's performance, as detailed below:

- (i) **Project description.** Describe project objectives, subprojects, implementation methods, and justifications for changes to subprojects, if any.
- (ii) **Project implementation.** Describe project implementation, noting the following aspects:
 - (a) Compare original and actual implementation schedules. Indicate delays, the length and causes of delays, and the remedial action taken.
 - (b) Compare cost estimates made during appraisal and actual costs (foreign and local). Indicate factors that contributed to any significant cost overruns or overestimation.
 - (c) Describe problems or difficulties encountered in recruiting consultants with reference to ADB procedures. Assess the consultant's work and the working relationship between the Executing Agency (EA) and the consultant. Using a design and monitoring framework is strongly recommended.
 - (d) Describe problems or difficulties encountered in procuring goods and services (including civil works) with reference to ADB procedures. Assess suppliers' and contractors' performance under the contract.
 - (e) Describe the extent to which the Borrower and EA comply with loan covenants, with reasons for noncompliance or delays in compliance and the remedial actions taken.
 - (f) State the reasons for any delays in loan utilization. Evaluate the appropriateness of the disbursement methods used. Justify any reallocation of loan proceeds.
 - (g) Describe problems or difficulties with subproject appraisal. Evaluate the EA's performance and capacity to appraise subprojects.
- (iii) **Evaluation of ADB's performance.** Describe ADB's performance, noting the following:
 - (a) Assess ADB's performance in supervising project implementation. Include comments on the adequacy of the consultants' terms of reference and appropriateness of specifications in tender documents. Evaluate the effectiveness and timeliness of assistance extended by ADB to solve implementation problems.
 - (b) Comment on problems encountered with ADB's procedures. Note the measures taken to resolve these problems and suggest changes in procedures and requirements.

C. Cost Estimates

12. The total cost of the consulting services, which will be entirely financed by ADB, is estimated at \$3.21 million, and is detailed in the following table:

Table A7: Cost Estimates
(\$'000)

Item	Total Cost
A. International Consultants	
1. Remuneration and Per Diem	2,416.50
2. International and Local Travel	339.00
3. Reports and Communications	51.30
B. Equipment	45.00
C. Training, Seminars, and Conferences	12.00
D. Miscellaneous Administration and Support Costs	56.55
E. Contingency	292.04
Total	3,212.39

Source: Asian Development Bank estimates.

ECONOMIC ANALYSIS

A. Traffic Analysis and Projections

1. Existing Traffic

1. Based on Papua New Guinea's existing vehicle fleet, the following vehicle types have been taken into account for the traffic analysis: (i) cars, (ii) pickups, (iii) buses and large public motor vehicles (PMVs), (iv) light trucks, (v) medium trucks (three axles), (vi) heavy trucks (four axles), and (vii) articulated trucks (six axles). The main features of each vehicle type are detailed in Table A8.1.

2. Traffic surveys were conducted on the proposed project road sections as a basis for determining average daily traffic. Seasonal patterns were used to obtain annualized average daily traffic and adopted as normal traffic for 2006 (Table A8.1)

3. The analysis of traffic distribution as detailed in the same table shows that cars and buses represent 40% of the total traffic, and pickups and trucks contribute equally to make up the remaining 60%.

Table A8.1: Annualized Average Daily Traffic

Subproject Road Sections	Categories of Vehicles							Annualized Average Daily Traffic
	Cars	Pick-ups	Buses and PMV	Light Trucks	Medium Trucks	Heavy Trucks	Articulated Trucks	
Rypinka–Okapa 1 and 2	82	136	6	116	0	0	0	340
	24%	40%	2%	34%	0%	0%	0%	100%
Goroka–Lahame	59	257	149	30	0	0	0	495
	12%	52%	30%	6%	0%	0%	0%	100%
Kamaliki–Move 1 and 2	49	118	47	47	29	0	0	290
	17%	41%	16%	16%	10%	0%	0%	100%
Kindeng–Kondopena	178	99	30	134	54	0	0	495
	21%	37%	21%	17%	4%	0%	0%	100%
Banz–Dona 1 and 2	233	165	147	56	13	0	0	614
	38%	27%	24%	9%	2%	0%	0%	100%
Gewa–Gembogle	101	66	58	130	28	8	0	391
	26%	17%	15%	33%	7%	2%	0%	100%
Kerowagi–Dona	127	71	21	96	39	0	0	354
	36%	20%	6%	27%	11%	0%	0%	100%
Keronige–Kerowagi	100	66	58	128	38	8	0	398
	26%	17%	15%	33%	7%	2%	0%	100%
Warumanda–Laiagam 1 and 2	257	214	13	0	79	30	19	612
	42%	35%	2%	0%	13%	5%	3%	100%
Ialibu–Kagua 1 and 2	151	60	19	110	34	4	0	378
	40%	16%	5%	29%	9%	1%	0%	100%
Ialibu–Pangia	77	99	44	96	52	0	0	368
	21%	27%	12%	26%	14%	0%	0%	100%

PMV = public motor vehicle.

Source: Asian Development Bank estimates.

2. Traffic Forecast

4. Normal traffic growth rates were based on the projected gross domestic product growth rate and estimated to be 3% per year for 2006–2025. Additional traffic is generated either because a journey becomes more attractive by virtue of its costing less or because of increased development brought about by the improved roads. For all sections, the generated traffic was assumed to equal 5% of normal traffic that would occur during the first year after rehabilitation works end. This assumes intense agricultural activity in the 11 project areas.

5. Volumes of traffic forecast on the project road sections are summarized in Table A8.2.

Table A8.2: Actual and Projected Average Traffic Volume (2006–2025)

Subproject Road Sections	Traffic Component	Years				
		2006	2010	2015	2020	2025
Rypinka–Okapa 1 and 2	Normal Traffic	372	418	485	562	640
	Generated Traffic	0	21	24	28	32
	Subtotal	372	439	509	590	672
Goroka–Lahame	Normal Traffic	524	590	684	793	919
	Generated Traffic	0	30	34	40	46
	Subtotal	524	620	718	833	965
Kamaliki–Move 1 and 2	Normal Traffic	317	357	413	479	540
	Generated Traffic	0	18	21	24	27
	Subtotal	317	375	434	503	567
Kindeng–Kondopena	Normal Traffic	467	525	609	706	818
	Generated Traffic	0	26	30	35	41
	Subtotal	467	551	639	741	859
Banz–Dona 1 and 2	Normal Traffic	651	733	850	985	1142
	Generated Traffic	0	37	42	49	57
	Subtotal	651	770	892	1,034	1,199
Gewa–Gembogle	Normal Traffic	424	477	553	641	720
	Generated Traffic	0	24	28	32	36
	Subtotal	424	501	581	673	756
Kerowagi–Dona	Normal Traffic	387	435	505	585	660
	Generated Traffic	0	22	25	29	33
	Subtotal	387	457	530	614	693
Keronige–Kerowagi	Normal Traffic	424	477	553	641	743
	Generated Traffic	0	24	28	32	37
	Subtotal	424	501	581	673	780
Warumanda–Laiagam 1 and 2	Normal Traffic	530	596	691	793	929
	Generated Traffic	0	30	35	40	46
	Subtotal	530	626	726	833	975
Ialibu–Kagua 1 and 2	Normal Traffic	423	476	552	640	720
	Generated Traffic	0	24	28	32	36
	Subtotal	423	500	580	672	756
Ialibu–Pangia	Normal Traffic	402	453	525	608	680
	Generated Traffic	0	23	26	30	34
	Subtotal	402	476	551	638	714

Source: Asian Development Bank estimates.

B. Economic Evaluation

1. General

6. The economic analysis was carried out for the 11 subproject roads by comparing scenarios with and without the Project using the highway design and management model. The economic analysis covers 20 years (2006–2025) for the upgrade-to-sealed option and 15 years (2006–2020) for re-gravelling, with construction periods of between 1 and 2 years starting in 2007. All benefits and costs are in constant 2005 prices. All prices are expressed in PNG kina.

7. In the scenario without the Project, the 11 subproject road sections are assumed to receive a minimum of maintenance to keep them at an average roughness measuring 16 on the International Roughness Index (IRI). The scenario with the Project includes routine and periodic maintenance.

8. During project preparation, two improvement options were considered, namely upgrade-to-sealed and re-gravelling, to determine which would be the more cost-effective. In the scenario with the Project, the average roughness would decrease to about 4.5 IRI after upgrading to sealed and would keep road surface roughness below 7 IRI. In the re-gravelling option, the average roughness of the road would be reduced to 6.5 IRI, and proposed maintenance would keep road surface roughness below 10 IRI.

2. Costs

9. Project economic costs include the financial roadwork costs in terms of materials, equipment, labor, and consulting services. Taxes and duties are excluded. Costs were divided into tradable and nontradable components. A standard conversion factor of 0.95 has been used to revalue goods and services at world prices into PNG kina, and a shadow wage rate factor of 0.5 has been applied to local unskilled labor to account for local unemployment and underemployment. These factors have been applied to capital and maintenance costs, as well as to vehicle operating and passenger time costs.

3. Benefits

10. Benefits are substantial from the 11 subproject roads because they have relatively high traffic usage due to active agricultural and commercial sectors, and because they are in poor or very poor condition. The main benefits are savings in vehicle operating costs and time for road users, and in maintenance costs.

11. Vehicle operating costs include the costs of (i) replacing spare parts, (ii) gas and diesel, (iii) lubricating oil, (iv) maintenance labor, and (v) crew wages. We used project economic costs as inputs to the analysis.

12. The value of time in the economic analysis is derived from two components: (i) working time and (ii) nonworking time. The value of working time during productive hours was derived from the average per capita income of K2,300. Assuming a 48-hour work week and 48 weeks of work per year, the value of a working hour used in the analysis was K1.00. Nonworking time was valued at a quarter of working time. This rate was used for bus and PMV passengers only. The rate was doubled for passengers in cars and pickups.

4. Results of Economic Analysis

13. Using a 12% discount rate, the economic benefits for the infrastructure components of the Project are substantial. The net present value is \$56.89 million and the economic internal rate of return (EIRR) is 18.8%. The net benefit streams are shown in Table A8.3.

Table A8.3: Net Benefit Streams—Undiscounted
(K million)

Costs				Benefits					
Year	Construction	Maintenance	Total	Normal Traffic VOC	Time	Generated Traffic VOC	Time	Total	Net Benefit
2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	59.44	(5.14)	54.30	(2.65)	(0.27)	0.00	0.00	(2.92)	(57.22)
2008	98.11	(9.28)	88.83	0.76	0.02	0.14	0.01	0.93	(87.90)
2009	11.23	(1.03)	10.20	19.67	1.46	0.51	0.04	21.68	11.48
2010	0.00	0.82	0.82	31.03	2.10	0.80	0.05	33.99	33.17
2011	0.00	2.11	2.11	37.34	2.48	0.94	0.06	40.82	38.71
2012	0.00	1.83	1.83	38.94	2.55	0.98	0.06	42.55	40.72
2013	0.00	1.14	1.41	29.31	2.01	0.74	0.05	32.11	30.70
2014	0.00	4.38	4.38	24.49	1.90	0.62	0.05	27.06	22.68
2015	0.00	3.15	3.15	38.12	2.54	0.98	0.06	41.71	38.56
2016	0.00	1.74	1.74	42.34	2.85	1.07	0.07	46.34	44.59
2017	0.00	4.04	4.04	43.80	2.93	1.10	0.07	47.91	43.88
2018	0.00	2.58	2.58	36.88	2.45	0.93	0.06	40.32	37.74
2019	0.00	0.97	0.97	29.76	2.23	0.76	0.06	32.80	31.83
2020	0.00	(7.21)	(7.21)	43.63	2.96	1.12	0.08	47.78	55.00
2021	0.00	3.19	3.20	17.48	1.59	0.45	0.04	19.55	16.35
2022	0.00	1.78	1.78	18.71	1.64	0.48	0.04	20.87	19.09
2023	0.00	(0.98)	(0.98)	16.24	1.42	0.41	0.04	18.11	19.08
2024	0.00	0.32	0.32	13.98	1.32	0.36	0.03	15.70	15.38
2025	0.00	(5.81)	(5.81)	19.13	1.79	0.51	0.05	21.47	27.28
									EIRR 18.77%
									NPV 56.89

() = negative, EIRR = economic internal rate of return, NPV = net present value, VOC = vehicle operating cost.

Source: Asian Development Bank estimates.

14. Economic analysis results for individual road sections are presented in Table A8.4.

Table 8.4: EIRRs and NPVs for Individual Subproject Road Sections

Province	Subproject	EIRR (%)	NPV (K million)
Eastern Highland Province	Rypinka–Okapa	19.8	7.50
	Kamaliki–Move	13.1	0.80
	Goroka–Lahame	19.1	4.48
Western Highland Province	Kindeng–Kondopena	13.7	1.19
	Banz–Dona	18.2	3.56
Chimbu Province	Gewa–Gembogl	26.2	7.38
	Kerowagi–Dona	21.7	5.61
	Korinige–Kerowagi	33.3	5.21
Enga Province	Warumanda–Laiagam	19.9	13.18
Southern Highland Province	Ialibu–Kagua	18.7	3.26
	Ialibu–Pangia	20.6	5.38

EIRR = economic internal rate of return, NPV = net present value.

Source: Asian Development Bank estimates.

5. Sensitivity Analysis

15. Sensitivity analysis was carried out to test the effects of negative changes in the key parameters that determine the benefits and costs of the Project. The analysis indicates that benefits outweigh costs for each of the following sensitivity tests: (i) increased rehabilitation costs, (ii) reduced benefits, (iii) increased costs and reduced benefits, (iv) delay in project implementation by 2 years, and (v) not considering benefits due to generated traffic.

16. The switching value¹ for increased rehabilitation costs was determined to be 42.5%, and the switching value for decreased benefits 29.9%. If the only benefits considered are vehicle operating cost savings of normal traffic, the EIRR would decrease only slightly to 18.22%. In what could be considered the worst case scenario—a combination of increased costs and decreased benefits—the net present value would be reduced to K8.16 million, and the EIRR to 12.91%, as shown in Table A8.5.

Table A8.5 Sensitivity Analysis

Sensitivity Test	Economic Internal Rate of Return (%)	Net Present Value (\$ million)	Switching Values (%)
Base case	18.77	56.89	
Increase rehabilitation costs by 15%	15.95	36.79	42.5
Reduce benefits by 15%	15.51	28.26	29.9
Increase costs by 15% and reduce benefits by 15%	12.91	8.16	
Do not consider benefits from reduced travel time	17.44	44.80	
Do not consider benefits from generated traffic	18.22	51.98	

Source: Asian Development Bank estimates.

¹ The switching value shows the percentage increase in a cost variable (or decline in a benefit variable) required for the NPV to become zero, which is the same as the EIRR being reduced to the cut-off level of 12%.

SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

A. Linkages to the Country Poverty Analysis			
Is the sector identified as a national priority in country poverty analysis?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is the sector identified as a national priority in country poverty partnership agreement?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<p>Contribution of the sector or subsector to reduce poverty in Papua New Guinea:</p> <p>Although Papua New Guinea (PNG) does not exhibit the widespread abject poverty present in some other developing member countries (DMCs), World Bank projections (2005) show the proportion of poor living under the national poverty line at 53% in 2003, compared with 37.5% in the benchmark year of 1996. PNG's human development index has improved since the mid-1970s but only very slowly. In 2005, PNG ranked 137, reflecting alarming economic and social disparities in the country. On the United Nations Development Programme poverty index, PNG ranks 68 among developing countries. PNG's main social indicators, such as life expectancy and maternal and child mortality rates, are still well below the averages for lower middle-income countries. PNG has limited primary healthcare. Infectious disease claims many lives, and there are serious public health risks from endemic diseases such as malaria and a generalized HIV/AIDS epidemic. In education, the rate of participation in primary schooling is improving, but it remains lower than in most other countries in the region.</p> <p>PNG has an abundance of natural resources including (i) large reserves of minerals, (ii) extensive forestry and fishery assets, (iii) significant potential for agricultural expansion, and (iv) many locations with potential for ecological and cultural tourism. Despite the potential of these resources, PNG's economic performance has fallen short of expectations. Economic growth has not kept pace with population growth, and performance varies considerably from year to year. Most of the population lives in rural communities with traditional village structures and depend on subsistence farming supplemented by cash crops. Only 15–20% live in the main urban areas of Port Moresby, Lae, Madang, Mt. Hagan, and Goroka. PNG has a relatively small dual economy, formal and informal. The formal economy is dominated by large-scale resource projects, particularly in mining and petroleum, and provides a large proportion of government revenue. However, the formal sector employs only around 15% of the workforce, with the informal economy supporting the remaining 85%, mostly through semi-subsistence agriculture.</p> <p>The impact of road construction on poverty reduction can be measured in terms of (i) increased access for rural communities to basic social services such as education and healthcare and local markets; (ii) increased employment opportunities for unskilled laborers in the project area; (iii) indirect and induced economic growth in the project-affected regions and the nation as a whole; and (iv) anticipated reductions in transportation costs to road passengers, freight users, and vehicle operators. Local communities clearly perceive that the poor condition of the prioritized road sections to be funded under the supplementary loans is a major factor retarding their economic and social development. Most of the roads are now so poor that the availability of both public and private means of transport along them has declined so far that most people can no longer regularly access services and markets in urban centers. There is no doubt that improving these roads would greatly facilitate access to a wider range of services and stimulate economic activity, especially cash cropping, and thus directly contribute to alleviating poverty in the target populations. Through the project performance monitoring system, the socioeconomic impact of the Project will be assessed and monitored according to selected socioeconomic indicators, which include (i) economic activity and income levels in the project area; (ii) industrial and agricultural outputs; (iii) transport costs and time; (iv) transport services and charges, (v) accident rates, (vi) degrees of access to functioning services, including school enrollment and infant mortality; (vii) access to information and services regarding sexually transmitted infections (STIs), including HIV/AIDS; and (viii) jobs created in road construction and maintenance. Employment impact indicators will include information about unskilled, poor, and female laborers.</p> <p>Rehabilitating and upgrading prioritized road sections under the supplementary loans is in line with the Medium Term Development Strategy (MTDS)^a, which highlights the importance of export-driven economic growth, rural development, and poverty reduction, including the promotion of agriculture, forestry, fisheries, and tourism. Under the MTDS, one of the mutually supporting expenditure priorities is rehabilitating and maintaining transport infrastructure. This is in line with the priorities set forth in the draft national poverty reduction strategy, which is structured around five pillars: (i) strengthened governance, (ii) increased development of land and natural resources, (iii) improved and maintained physical infrastructure, (iv) improved and expanded economic growth opportunities, and (v) strengthened and expanded social services.</p>			

B.	Poverty Analysis	Proposed Classification: General intervention
<p>According to the most recent census (2000), each of the five provinces in the project area—which includes Northern Highlands, Southern Highlands, Eastern Highlands, Chimbu, and Enga—has a population of between 300,000 and 500,000. Extremely wide ethnic and cultural diversity characterizes all five provinces, as is reflected in the very large number of languages spoken. Mutual hostility between, and often within, language groups is the norm, and this is reflected in localized tribal fighting. Despite this high diversity, the traditional way of life of these different groups is very similar, as reflected in settlement patterns, styles of houses, and reliance on subsistence economies. The Highlands settlement pattern is one of isolated homesteads or small, dispersed hamlets. Villages with concentrations of closely spaced houses are uncommon. Almost all of the houses are built from bush materials, i.e., wooden frames with woven walls and thick thatched-grass roofs. Most of the affected people will be subsistence agriculturalists who obtain a small income by selling cash crops such as coffee, vegetables, and peanuts. The crops grown are a mixture of traditional and introduced plants. In most areas, the main crop is sweet potato (<i>kaukau</i>), and commonly more than half of the crop is fed to pigs, which are kept as prestige items for ceremonial exchange. Most communities suffer no shortage of garden foods for subsistence consumption. A few people along the roads earn irregular cash income from road maintenance works, but the availability of cash work has declined in recent years as funds allocated to road maintenance have declined. Workforce, vocational, and business skills are generally weak, especially outside the major towns. The levels of literacy and health are very poor. Illiteracy rates in the Highlands are about 67% (compared with a national average of 55%), with the women's illiteracy rate of 75% higher than the male illiteracy rate of 60%. Physical infrastructure in the Highlands is inadequate to support economic and social development. The provision of Government education, health, and policing services is very poor, especially in rural areas. Commercial support services such as legal services, accounting, and marketing are limited outside the main cities. Law and order problems, including tribal fighting and crimes such as robbery, murder, assault, and destruction of property, have long been a feature of most parts of modern PNG and afflict road users as well as the wider population. The law and order situation in the provinces traversed by the Highlands Highway is grim and reported to be deteriorating.</p>		
C.	Participation Process	
<p>Is there a stakeholder analysis? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Extensive consultations with central and provincial governments and local stakeholders on the selection of road sections were conducted during the loan reconnaissance mission in November 2005. The original list proposed by the central Government included two roads for each province. While there was a consensus over most of the roads, Enga and Chimbu provinces expressed different views. The reconnaissance Mission assessed their requests on the grounds of economic and social development, linkage to the ongoing project, project cost, and project readiness, and conducted further consultations with the central Government. An agreement was obtained on the prioritized list of road subprojects. Iterative consultations by the Highlands Region Maintenance Group (HRMG) community relations officer, and by the Asian Development Bank (ADB) team during the loan Fact-Finding Mission in February 2006, further confirmed ownership and commitment to the prioritized list from a broad range of stakeholders, including landowners, community leaders, vehicle operators, freight shippers, road constructors, private sector entrepreneurs and shopkeepers, and community-based nongovernment and faith-based organizations. Stakeholder analysis identified critical social and gender issues, and mitigation of anticipated impacts are reflected in the design of the supplementary loans.</p> <p>Is there a participation strategy? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Communities' participation and their involvement in road rehabilitation and upgrading is a distinctive feature of the ongoing Project, which will be consistently carried through in the proposed supplementary loans. HRMG's community relations officer has been indispensable in (i) ensuring that local villagers and landowners are fully apprised of any work that may affect them; (ii) seeking villagers' and landowners' active support for the roadwork by explaining to them and their communities the potential benefits and inherent risks associated with road construction; (iii) mitigating and/or avoiding claims and disputes; (iv) helping to resolve disputes; and (v) ensuring women's adequate participation in project activities and their employment in labor-intensive road maintenance. The proposed supplementary loans will build on communities' existing involvement in roadwork and ensure more systematic documentation and incorporation of community-related initiatives—with emphasis on women's participation and involvement in road-related activities—in project progress reports and the project performance monitoring system. The community initiative component to be funded by the supplementary loans will promote (i) continuous support to community involvement in road maintenance and (ii) community-based, gender-responsive training on road maintenance, road safety (under the aegis of the Provincial Works Administration) and STI/HIV/AIDS prevention (under the aegis of the Provincial Works Administration, in consultation with Provincial AIDS Council and Health Administration).</p>		

D. Gender and Development**Strategy to maximize impacts on women:**

In the Highlands' project area, women are currently involved in a broad range of activities related to road construction and maintenance and commercial roadside services. The supplementary loans will build on critical lessons learned from Loan 1709-PNG and proactively support women's and women groups' manifested interest in the employment and business opportunities associated with project road construction and maintenance. The two-pronged approach to maximize impacts on women will involve the following:

- (i) Adoption of employment targets to support women's involvement in road rehabilitation, upgrading, and maintenance. In this respect, DOW, through HRMG, will encourage public works contractors to increase the percentage of women workers to 50% of wage laborers.
- (ii) Community-based, gender-responsive STI/HIV/AIDS prevention. In PNG, the HIV/AIDS Management and Prevention Act (2003) supports a multisector and gender-responsive approach to HIV/AIDS prevention. The International Federation of Consulting Engineers' HIV and AIDS prevention provisions have been adopted by DOW for inclusion in the contract documents for road construction and maintenance projects. Risk mitigation measures to be adopted under the Project will include (a) specific assurances to ensure STI/HIV/AIDS prevention by road contractors in the campsites and (b) community-based, gender-responsive STI/HIV/AIDS training along the prioritized road sections, to be organized by the HRMG community relations officer, in collaboration with the Provincial AIDS Council and Health Administration, under the Community Initiative Component.^b

Has an output been prepared? ☐ Yes ☒ No

E. Social Safeguards and other Social Risks

	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
Resettlement	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	There are no resettlement needs because the proposed Project will rehabilitate existing road sections, at their existing width to improve connectivity.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Affordability	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	No tolls are proposed for road use.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Labor	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	Labor-intensive construction methods and small-scale local contracting will provide opportunities for employing unskilled workers, with a proactive approach to women's employment.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Indigenous Peoples	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	In the project area, no particular group is considered dominant. In terms of impact, the proposed works are within the existing right-of-way, and land acquisition and disruptions to local communities will be insignificant. The Project will create employment opportunities for local communities through the equitable distribution of jobs made available under PNG law.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Other Risks/ Vulnerabilities	<input type="checkbox"/> Significant <input checked="" type="checkbox"/> Not significant <input type="checkbox"/> None	PNG has an HIV generalized epidemic, with prevalence rates among people aged 15 to 49 higher than 1% in rural areas. The inherent risk of STI/HIV/AIDS is acknowledged, in light of the increased road traffic and connectivity. Risk mitigation measures to be adopted under the Project will include (a) specific assurances to ensure HIV/AIDS prevention by road contractors in their campsites and (b) community-based STI/HIV/AIDS training along project roads, to be organized by the HRMG community relations officer in collaboration with the Provincial AIDS Council and Health Administration.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

^a Government of Papua New Guinea. 2004. The Medium-Term Development Strategy. Port Moresby.

^b The proposed activities will be limited to the prioritized road sections. They will build upon and complement the anticipated impact of the ADB grant for HIV/AIDS Prevention and Control in Rural Development Enclaves Project. This will be done by empowering DOW, through HRMG, to deliver on its commitment to HIV/AIDS prevention, in line with the multisector approach adopted under the HIV/AIDS Management and Prevention Act (2003) and the DOW policy on HIV/AIDS prevention.

SUMMARY INITIAL ENVIRONMENTAL EXAMINATION

A. Introduction

1. The summary initial environmental examination (SIEE) outlines the findings and recommendations of the environmental assessment of 11 road sections proposed for supplementary financing in Loan 1709-PNG.¹ The environmental assessment process follows and complies with the Papua New Guinea (PNG) environmental regulatory framework and the Asian Development Bank (ADB) *Environment Policy* and guidelines. Under the PNG environmental assessment regulatory framework (i.e., the Environment Act 2000, complemented with the Prescribed Activities Regulation [Statutory Instrument No. 30 of 2002]), upgrading and rehabilitating existing provincial road sections are categorized as level 1 and do not require formal approval (i.e., an environmental permit) from the Department of Environment and Conservation (DEC).² Under the ADB guidelines, the supplementary loans have been categorized as environmental category B. Initial environmental examination (IEE) reports have been prepared for the 11 proposed road sections in accordance with the ADB *Environmental Assessment Guidelines* (2003) and comply with the ADB *Environment Policy*.

B. Description of the Project

2. Supplementary loans will finance the upgrading and rehabilitation of 11 additional road sections with a total length of 270 km in the five Highlands provinces. The total cost is estimated at \$76.27 million. The design for rehabilitating and upgrading will follow the Department of Works (DOW) Road Design Manual. The proposed horizontal and vertical alignments will closely follow existing alignments, requiring minimal earthworks. However, the pavement reservation defined in the Road Design Manual was modified in specific locations to reduce adverse environmental impacts and construction costs. Construction works will entail (i) removing vegetation immediately adjacent to the road (within the right of way), (ii) excavating and disposing of unsuitable material from road shoulders and cuttings, (iii) placing and compacting granular base, and (iv) sealing selected road sections. Existing pipe culverts will be rehabilitated and retained, and new headwalls and aprons provided as necessary. Additional transverse culverts are required to improve drainage of the road area. Additionally, longitudinal culverts and/or shallow drains will be provided to facilitate access to adjoining homesteads and commercial developments. Most of the 52 bailey and steel girder bridges will require only minor repairs.

C. Description of the Environment

1. Physical Resources

3. The proposed road sections are located in the mountainous region of PNG known as the Highlands. Numerous, sometimes large, valleys at 1,100–1,800 meters above sea level (masl) are divided by often steep and rugged ranges of hills and mountains, which reach altitudes in many places of more than 3,000 masl. Small earthquakes and heavy rainfall are responsible for many deteriorated sections of all national and rural roads, particularly in Eastern Highlands and Chimbu provinces. There is a marked increase in the annual rainfall from the eastern and

¹ ADB. 1999. Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Papua New Guinea for the Road Maintenance and Upgrading (Sector) Project. Manila (approved on 16 November).

² However, a permit will be required if roadwork involves level 2 activities.

southern parts (1,280 and 2,880 millimeters/year, respectively) toward the central parts of the Highlands (more than 3,000 millimeters/year).

2. Ecological Resources

4. In the Highlands, almost all of the area below the effective upper limit of cultivation, at about 2,400 masl, is covered with a mosaic of gardens, tree crops (especially coffee), grasslands and shrub lands, groves of useful timber trees, and patches of regrowth forest. Many hills and ridge tops had little gardening in the past, and dense regrowth forests of mid-montane trees remain. Where forests survive, they are used for hunting, mainly using traditional methods. None of the proposed road sections traverses an environmentally sensitive area. No forestry concessions exist in any areas accessible from the roads currently under consideration for rehabilitation and upgrading.

3. Human and Economic Development

5. In 2000, the five provinces comprising the Highlands had a total population of almost 2 million people, about 40% of the total PNG population. The population of the districts where the road sections are located was approximately 884,000. Most of the beneficiaries in the target area are subsistence agriculturalists who obtain a small income by selling cash crops such as coffee, vegetables, and peanuts. Local residents sell their produce to other locals and the traveling public. Most of the markets are established within the right of way, but generally there are no fixed structures close to the road.

4. Quality of Life Values and the Sociocultural Environment

6. Extremely wide ethnic and cultural diversity characterizes the Highlands, which is reflected in the several hundreds of languages spoken there. Mutual hostility between language groups is the norm, bringing localized tribal fighting. About 97% of the land remains in customary collective ownership, though this does not give any clear guarantee of tenure. Land is not regarded as a commodity that can be bought and sold by individuals, but as a permanent and integral part of a village community. The complex land tenure arrangement is also a constraint on the state's ability to impose statutory law over customary law.

D. Forecasting Environmental Impacts and Mitigation Measures

1. Environmental Benefits

7. Local communities may benefit from the improved road conditions through (i) reduced dust nuisance, (ii) improved drainage along the road, (iii) improved land stability at filled-up locations, and (iv) improved mobility and health. Proceeds from increased employment and economic opportunities may subsequently be invested in improving communities' living and environmental conditions.

2. Design and/or Preconstruction Phase Considerations

8. During the design and preconstruction phase, ample attention has been given to integrating concerns related to (i) potential adverse impacts on protected or environmental sensitive areas (mitigated by ensuring that none of the proposed road sections will traverse or impact such areas); (ii) the application of appropriate technical solutions to address higher

occurrence of landslides and subsequent erosion risks, especially in Chimbu and Eastern Highlands provinces; (iii) safety issues by limiting the expected speed increase on the road sections; (iv) cultural sites (by describing procedures to be followed for ceremonial and burial sites along the road section); and (v) other social and community concerns, as also experienced while implementing Loan 1709-PNG.

3. Environmental Impacts and Mitigation Measures during the Construction Phase

9. Construction works will result in limited temporary adverse environmental impacts, but they can be minimized by ensuring proper construction practices and adequate compliance monitoring. Some of the key environmental impacts that have been identified and their mitigation measures are as follows:

- (i) Clearing vegetation and excavation works may result in erosion and loss of sediments, which will be mitigated by minimizing soil and vegetation clearance.
- (ii) Changes in drainage patterns may cause obstruction of storm water flow and increased flooding and siltation, which will be mitigated by controlling storm water and drainage.
- (iii) Noise and dust will increase along the roadsides during roadwork, which will be mitigated by spraying exposed surfaces during dry periods, proper maintenance of equipment, and careful selection and management of quarries.
- (iv) Health and safety risks will be mitigated by ensuring all occupational health and safety requirements in place on construction sites and work camps.
- (v) Pollution from waste disposal will be mitigated by adequate offsite and waste management, satisfying safety and health concerns.
- (vi) The residual impact from decommissioning construction sites will be mitigated by satisfactory decommissioning procedures.

A more complete list of environmental impact and mitigation measures is presented in the environmental management and monitoring plans (EMMP).

4. Environmental Impacts and Mitigation Measures during the Operational Phase

10. Environmental impacts during the operational phase will be mainly noise, dust, and vehicle emissions affecting air quality, as well as traffic accidents. The noise impact is considered low because (i) the volume of traffic is quite low, (ii) there are few heavy vehicles on the road, (iii) vehicles will move slowly because of speed restrictions; and (iv) noise from individual vehicles will be lower on sealed sections than on the existing gravel. Air quality impacts from vehicle emissions will be low also because of low traffic volumes and is not likely to have significant health impacts. An increased risk of traffic accidents will be mitigated through (i) speed reduction measures (e.g., installing speed bumps at settlements, schools, and markets), (ii) off-road boarding areas for PMVs, (iii) improved road signage and pavement markings, and (iv) consultations and awareness campaigns with local communities.

5. Cumulative Impacts

11. No significant cumulative impacts from the supplementary loans have been identified. The most likely cumulative impacts are general, related to increased economic activity in the Highlands. However, none of these is considered significant.

6. Environmental Management Plan

12. The findings and proposed mitigation measures for each subproject have been compiled into an EMMP included in the IEE reports. Where appropriate, implementation details will need to be elaborated and updated and will be subject to review as part of the bidding evaluation procedures. Mitigation measures and a monitoring plan have been prepared and discussed with DEC (a summary is included in Table A.10). The total cost of implementing the monitoring plan during the construction phase is estimated at K75,000 per year.³ Monitoring costs during the operations phase is estimated at K1,000/year/road section. A monitoring checklist, based on EMMP, will be used in the field for monitoring and reporting.

E. Institutional Requirements and Environmental Monitoring Plan

13. As the Executing Agency for the supplementary loans, DOW will be responsible for implementation and compliance with EMMP. Day-to-day implementation and compliance monitoring will be the task of the environment officer of the HRMG, under the supervision of the field project manager and supported by the provincial field supervision engineers. The findings of regular monitoring activities, as specified in the monitoring plan, will be included in the quarterly progress reports to be submitted to ADB. These will include (i) an overview of the status of EMMP preparation and (ii) compliance with completed EMMP. The progress reports will be submitted for information to DEC and ADB, with copies provided to the DOW environment coordinator in Port Moresby. Compliance with EMMP will be subject to assessment by review missions from ADB and/or DEC and included in the project completion report.

14. HRMG staff members have gained the necessary experience in compliance monitoring during the implementation of Loan 1709-PNG. Combined with improved project procedures and the additional capacity building and quality control to be provided by the implementation consultants, the capacity of HRMG to carry out compliance monitoring and reporting is considered adequate. Because anticipated environmental impacts are limited and monitoring techniques are straightforward, no further specific training activities are required.

F. Public Consultation and Disclosure

15. During January and February 2006, consultations were held with local communities in the affected districts and government officials in provincial capitals in the Highlands and Port Moresby. The findings of the consultations along nine proposed road sections⁴ confirm strong overall support and willingness to cooperate with HRMG and contractors in implementing the subprojects. Support from provincial governments has been demonstrated through their active involvement in discussing and resolving implementation arrangements with the local communities during the current subprojects of Loan 1709-PNG. Since 2000, the provincial governments of Chimbu, Western Highlands, Eastern Highlands, and Enga have signed agreements with community representatives on implementation arrangements for the various HRMG subprojects.

16. Documented support for the individual subprojects and pledged cooperation with HRMG are included in the separate IEE reports. Beneficiary consultations will be continued throughout the preparation and construction phases. Records of environmental and social complaints

³ Based on K3,000 per road section for preparing the quarry management plan and obtaining the DEC environmental permit, and K2,000/year/road section for monitoring.

⁴ Consultations for the Southern Highlands were started in 1999 as part of the preparation for Loan 1709-PNG.

received during consultations, field visits, and/or informal discussions, or by formal letter—together with the subsequent follow-up—will be kept in a simple database in the HRMG project office.

G. Findings and Recommendations

17. Discussions with HRMG staff, a review of documents, and field assessments of most of the proposed road sections lead to the conclusion that significant and/or irreversible impacts are unlikely and that the subprojects comply with ADB's environmental safeguard policies. In particular, the proposed subprojects are not located in environmentally sensitive or conservation areas, will not increase logging or hunting, and are strongly supported and requested by the local communities. No significant associated or cumulative impacts are identified. Therefore, a more detailed environmental impact assessment is not warranted, and the IEEs will be completed as the final environment assessment documents of the Project.

H. Conclusions

18. The initial environmental screening process and analysis of potential environmental impacts lead to the conclusion that the proposed subprojects are unlikely to result in any direct, significant adverse environmental impact. The scope of rehabilitating and upgrading the proposed road sections, and their anticipated environmental impacts, are of a magnitude that does not require further study. As listed in the environmental management plan, all potential environmental concerns can be properly mitigated. Consequently, the environmental monitoring plan (Table A.10) provides sufficient guidance for HRMG to successfully monitor and report on environmental compliance during subproject implementation.

Table A.10: Summary Mitigation Measures and Environmental Monitoring Plan

Issue	Location	Mitigation Measures	Verification	Frequency (Costs)	Implementation and Supervision
Social or Community Concerns	Potential road alignment and quarry sites	Plan activities to minimize displacement of residents, discuss the projected impacts, negotiate proposed measures in advance with the affected community, and work with local government officers and NGOs.	Project progress reports Verbal and/or formal complaints	Continuous (minimal costs, included in standard supervision)	Contractors, under supervision of Provincial HRMG staff, supported by Env. and QA officers/PIA.
Soil Instability and Erosion	All areas where clearing is required	Reduce the time surfaces remain bare. Keep vegetation clearing to a minimum. Avoid disturbing steep slopes.	Visual check Verbal and/or formal complaints	Continuous (minimal costs, included in standard supervision)	Contractors, under supervision of Provincial HRMG staff, supported by the Env. and QA officers/PIA.
Controlling Sediment and Storm Water	All areas where clearing is required	All disturbed areas that are not to be paved (e.g., batters) should be re-vegetated or prepared for natural re-vegetation after final land shaping. Avoid discharging water onto unstable slopes or old landslips. Temporarily divert runoff from nonconstruction areas around the construction areas. Store oil and bituminous products in an appropriate manner at a contained location away from drainage lines.	Visual and field inspection Verbal and/or formal complaints	Continuous (minimal costs, included in standard supervision)	Contractors, under supervision of Provincial HRMG staff, supported by Env. and QA officers/PIA
Management of Stockpiles, Spoil-heaps, Batters	Dumping areas	Discussions about dumping to be held with local landowners. The stockpile or spoil-heap location should be chosen to avoid blocking surface runoff or drainage lines. Where possible, spoil should be used to backfill quarry areas or waste disposal pits before they are re-vegetated.	Visual field checks Verbal and/or formal complaints	Continuous (minimal costs, included in standard supervision)	Contractors under supervision of Provincial HRMG staff, supported by Env. and QA officers/PIA
Air Quality, Dust, and Noise Control	All construction areas, access routes, and quarry sites	Spray water on exposed surfaces during dry periods. Wet quarry and road fill loads carried in open trucks. Use modern and well maintained equipment. Carry out noisy construction activities during normal work hours. Advise local people when there will be blasting or unusual, unavoidable noise.	Visual field checks Verbal and/or formal complaints	Continuous during dry periods (minimal costs, included in standard supervision)	Contractors under supervision of Provincial HRMG staff, supported by Env. and QA officers/PIA
Quarry Selection and Management.	All proposed quarry sites	Appropriate actual plans of extraction. The methods that will be used for mitigating environmental impacts. Safety methods that will be put in place to reduce road accidents in village or urban areas. Plans to rehabilitate or re-vegetate the site after use to reduce visual impacts and sediment runoff.	Visual field inspections Verbal and/or formal complaints	From quarry development to closure (to be determined)	Contractors under supervision of Provincial HRMG staff, supported by Env. and QA officers /PIA

Issue	Location	Mitigation Measures	Verification	Frequency (Costs)	Implementation and Supervision
Safety and Health	All construction and quarry sites Construction camps	Ensure all occupational health and safety requirements are in place on construction sites and in work camps. Install lights and cautionary signs in hazardous areas. Use personal protection equipment.	Visual field inspections Verbal complaints by workers	Continuous (minimal costs, included in standard supervision)	Contractors under supervision of Provincial HRMG staff, supported by Env. and QA officers/PIA
Site Decommissioning	All construction and camp sites	Rake or loosen all compacted ground surfaces. Establish a site re-vegetation plan. Where possible involve local women's groups to provide materials and implement re-vegetation.	The number of replanting agreement with communities	After completing construction (minimal costs, included in standard supervision).	Contractors under supervision of Provincial HRMG staff, supported by Env. and QA officers/PIA
People's Safety (Operations Phase)	Sensitive areas (settlements, schools, and markets)	Measures to slow traffic (e.g., installing speed bumps at selected places such as settlements, schools, and markets). Off-road boarding places for PMVs. Sealing to suppress dust. Improvements in road signage and pavement markings.	Visual checks Verbal and/or formal complaints.	Annually after construction (K500 per year)	Contractors under supervision of DOW headquarters, provincial governments, and ADB supervision
Rehabilitation and Maintenance (operations phase)	Entire road section	Regular monitoring and inventory of risks for erosion and drainage problems. Conduct routine maintenance like grading, grass cutting, drain clearing, pothole patching, and shoulder repairs.	Visual checks Verbal and/or formal complaints.	Annually after construction (K500 per year)	Contractors under supervision of DOW headquarters, provincial governments, and ADB supervision

Env. = environment, PIA = provincial implementation advisor, QA = quality assurance.

Source: Asian Development Bank.