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Report No. 10018-BO

STAFF APPRAISAL REPORT

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

MAY 19, 1992

Country Department III
Infrastructure Operations Division
Latin America and the Caribbean Region

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CURRENCY EQUIVALENT

(As October 25, 1991)

US\$1.00	=	3.70 Bolivianos (Bs.)
US\$0.27	=	1.00 Boliviano
US\$1.36555	=	1 SDR

FISCAL YEAR

January 1 - December 31

ACRONYMS AND ABBREVIATIONS

AADAA	Administración Autónoma de Almacenes Aduaneros (<i>Autonomous Customs Warehouse Administration</i>)
CAF	Corporación Andina de Fomento (<i>Andean Development Corporation</i>)
COMIBOL	Corporación Minera de Bolivia (<i>Bolivian Mining Corporation</i>)
CRD	Corporación Regional de Desarrollo (<i>Regional Development Corporation</i>)
DDV	Dirección Departamental de Vialidad (<i>Regional Road Department</i>)
EBM	Expenditure Budgeting Model
ECP	Export Corridors Project
ENDE	Empresa Nacional de Electricidad (<i>National Power Company</i>)
ENFE	Empresa Nacional de Ferrocarriles del Estado (<i>National Railway Company</i>)
ENTEL	Empresa Nacional de Telecomunicaciones (<i>National Telecommunications Company</i>)
ERR	Economic Rate of Return
ESF	Emergency Social Fund
EU	Environmental Unit
FY	Fiscal Year
GDP	Gross Domestic Product
HDM-III	Highway Design and Maintenance Model, 3rd Version
ICB	International Competitive Bidding
IDB	Inter-American Development Bank
INPEX	Instituto Nacional de Promoción de Exportaciones (<i>National Institute for Export Promotion</i>)
LCB	Local Competitive Bidding
LIB	Limited International Bidding
MTC	Ministerio de Transporte, Comunicaciones y Aeronáutica Civil (<i>Ministry of Transport, Communications and Civil Aeronautics</i>)
OECF	Overseas Economic Corporation Fund of Japan
PPF	Project Preparation Facility
RIC	Reconstruction Import Credit
SAE	Sistema de Administración de Equipo (<i>Equipment Management System</i>)
SAM	Sistema de Administración de Mantenimiento (<i>Maintenance Management System</i>)
SNC	Servicio Nacional de Caminos (<i>National Road Authority</i>)
SOE	Statement of Expenditures
TGN	Tesoro General de la Nación (<i>National Treasury</i>)
UEP	Unidad Ejecutora del Proyecto (<i>Project Implementation Unit</i>)
UN	United Nations
YPFB	Yacimientos Petrolíferos Fiscales Bolivianos (<i>Bolivian National Oil Company</i>)

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT
Staff Appraisal Report

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This report is based on the findings of the appraisal mission which visited Bolivia from June 26 to July 11, 1991. The mission comprised Messrs. Jose María Alonso-Biarge, Task Manager/Transport Engineer and Robin Carruthers, Consultant/Economist. Peer review was provided by Messrs. John Flora and William Paterson (technical issues). The report was prepared under the supervision of Mr. Graham Smith, Division Chief and Mr. Yoshiaki Abe, Director. Ms. Anna Maria Galasich assisted in the production of the report.

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

CREDIT AND PROJECT SUMMARY

Borrower: Government of Bolivia

Amount: SDR 58.6 million (US\$80 million equivalent)

Terms: Standard, with 40 years maturity

Project Objectives: (a) Improve road conditions in order to reduce vehicle operating costs, improve access to markets and encourage trade development; (b) improve the road maintenance budget process; (c) improve road maintenance management, planning and operations; (d) improve investment planning; (e) assure adequate maintenance funding and financial self sufficiency for the national road authority (SNC - Servicio Nacional de Caminos); (f) strengthen the domestic construction industry and, (e) transfer maintenance technology and organization to the road regional directorates if the decentralization of road administration, planned for 1992, takes place.

Project Description: The Project will finance the SNC's maintenance plan for 1992-1995, which will allow SNC to reduce the large backlog of maintenance and to match maintenance budgets to real needs, optimizing investment decisions. This cannot be achieved by SNC without additional financing and technical support to ensure that the funds are well spent. The Project will comprise: (a) periodic maintenance by contract of 781 km of the paved network and 765 km of the gravel network (engineering design and construction supervision to be included); (b) periodic and routine maintenance program by force account; (c) maintenance and rehabilitation works on 77 bridges; (c) work compound and warehouse construction; (e) rehabilitation of maintenance equipment; (f) complementary equipment purchases; (g) road safety program; and (h) technical assistance for: studies of road maintenance decentralization, road infrastructure financing, and construction industry; project management; and training for equipment operators and users of the management systems. The Project's share in financing the SNC maintenance budget will decline after 1994, until the maintenance budget for 1996 is totally financed by the Government. To ensure compliance with this plan, an agreement will be reached with the Government by September 30, 1994, on the mechanisms for financing road and bridge maintenance for 1996 and thereafter, based on the recommendations of the Road Maintenance Financing Study and the assessment of the SNC's planning and budgeting performance in the two preceding years.

Project Benefits: The Project will result in substantial upgrading of about 33% of the maintainable network, with 100% of the paved network and 70% of the gravel network in good or fair condition in 1996. The Project will also improve maintenance planning and organization and budgetary control. Other project benefits include higher availability of road equipment, reduction in maintenance costs, and introduction of effective and systematic maintenance practices, including the use of contractors for maintenance. As a consequence, vehicle operating costs are expected to decline. Average rate of return is 39% for all the roads in the project.

Project Risks: The main risk is delay in implementation due to lack of counterpart funds. To minimize this risk, an agreement has been reached with the Government to allocate, in its recurrent budgets, the necessary counterpart funds for the Project. Another potential risk is institutional weakness, especially if the decentralization is carried out. The decentralization of the administrative procedures and controls may be difficult, mainly because of the lack of qualified staff at the departmental level. Institutional weakness may be limited by strengthening the maintenance department of SNC (in particular the Project Executing Unit and the possible decentralized agencies), by close supervision, and by extensive training programs. The proposed Project includes financing for these purposes.

<u>Project Cost</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>		
	-----US\$ Million-----				
(a) Periodic Maintenance by Contract (Paved Network)	9.0	36.4	45.4		
(b) Periodic Maintenance by Contract (Gravel Network)	3.7	15.0	18.7		
(c) Maintenance by Force Account	116.7	14.8	131.5		
(d) Bridge Maintenance and Rehabilitation	0.7	2.8	3.5		
(e) Workshop Construction	1.0	2.5	3.5		
(f) Equipment	1.5	3.4	4.9		
(g) Road Safety Program	0.5	1.1	1.6		
(h) Institutional Strengthening	0.0	2.6	2.6		
(i) Procurement Services	0.0	3.0	3.0		
Physical Contingency	1.8	5.2	7.0		
Price Contingency	<u>10.1</u>	<u>8.2</u>	<u>18.3</u>		
TOTAL	145.0	95.0	240.0		
<u>Financing Plan</u>					
Government	145.0	15.0	160.0		
IDA	-	80.0	80.0		
<u>Estimated Disbursements</u>					
	-----Bank Fiscal Years-----				
	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>
Annual	12.0 ^{a/}	22.4	24.8	15.2	5.6
Cumulative	12.0	34.4	59.2	74.4	80.0
<u>Estimated Economic Rate:</u>	39% weighted average for all roads in the Project.				
^{a/} Includes initial deposit to Special Account and retroactive financing					
<u>Map:</u> IBRD 23114R					

I. THE TRANSPORT SECTOR

A. Introduction

1.1 Bolivia faces a particularly difficult set of development challenges. Endemic political instability in the past has made it difficult for Bolivia to sustain development policies and strategies for long. Annual population growth rates of 2.8% have been too high and economic growth too low for sustained improvements in living standards. As a result, Bolivia is one of the poorest countries in Latin America; its 7.3 million inhabitants are poorly educated (functional illiteracy at 50%); its health indicators are among the worst in the continent (infant mortality at 117 per 1000); a large proportion of its population faces poverty (80% of the population earn less than 70% of the income required to cover a basic needs basket); and it has extremely poor infrastructural and social services (e.g. only 30% of the urban population is connected to a sewerage system and only 15% of rural population has latrines). About one-half of the economically active population is employed in agriculture, primarily on the highland of the altiplano where subsistence farming predominates. The investment climate, while improving, remains uncertain, particularly due to continued dominance of the state in the mineral, hydrocarbons and energy sectors. The economy continues to rely heavily on a few export commodities in hydrocarbons and mining for growth, making it vulnerable to external market fluctuations.

1.2 Following a political and economic crisis from 1980 to 1985, culminating in hyperinflation over 24,000% in annual terms, the Government in late 1985 launched its New Economic Policy, which stopped the hyperinflation and launched a long-term adjustment program to reduce the role of the state and build a free market economy. Strict controls on public sector expenditures, increases in public sector prices, a tight monetary policy and a sharp depreciation of the exchange rate greatly reduced the fiscal deficit and domestic credit creation. At the same time, the Government undertook a comprehensive reform of economic policy to liberalize trade, labor and financial markets and provide a structure of incentives conducive to private sector development, including establishment of a foreign exchange auction system, a thorough reform of the tax system, complete freeing of prices and interest rates, and sweeping trade liberalization with a low uniform import tariff. The new policy stance succeeded quickly in restoring macroeconomic stability.

1.3 The Jaime Paz Government, which took office in August 1989, continued the stabilization and liberalization programs under difficult conditions and began to implement many of the policy and legislative changes which were established by the previous administration. Continuous prudent macroeconomic management permitted the recovery to be sustained with steady GDP growth of 2.7% on average through 1990 and an estimated 4.0% for 1991. Exports were the most dynamic element of the economy, expanding 18% annually between 1987 and 1991. The fiscal deficit has been reduced to below 3% of GDP in 1991 and inflation was contained below 16% on average during this period.

1.4 The Government's medium-term strategy aims to achieve GDP growth of 4% to 5% per year, to maintain price stability, and to alleviate poverty. Higher GDP growth will depend largely on an acceleration of private sector economic activity, which in turn requires: (i) maintenance of economic stability through

continued tight fiscal policies and market determination of the exchange rate; (ii) continued policy reforms to improve the business environment; (iii) restructuring of the banking system to expand the availability of capital for private investments; (iv) improvement in the basic infrastructure to support expansion of economic activities; and, (v) improvement in the education and health systems to improve the state of human resources.

B. Transport Sector and the Economy

1.5 A well functioning transport system is crucial to the sustained economic recovery of Bolivia. Bolivia faces serious problems of transport infrastructure: distances between cities are long, rural areas are thinly populated, mountains and rivers act as barriers, and the country has no direct access to the sea. These natural disadvantages are formidable and dictate that transport costs will be high throughout the economy. The main linkages between transport and the economy are evident in three key areas: (a) the geography of the country; (b) physical condition of the transport network; and (c) the physical location of the network vis a vis areas with high development potential.

1.6 First, the geographic conditions, the landlocked position and the size of the country give transportation an extraordinarily strategic role in economic development. Bolivia has a large territory of 1.1 million square kilometers (slightly larger than France and Spain combined) with a small population of 7.3 million (one thirteenth of France and Spain combined). The overall population density of 6.5 people per square kilometer is the lowest in Latin America, making the provision of transport infrastructure more costly per capita than in other countries. The geography of Bolivia spans from a peak of 6,500 meters in the highlands of the Andes to 200 meters above sea level in the lowlands of the Amazon basin. The spectacular change in elevation makes for unusually high transport costs both in terms of initial construction costs as well as in operating costs. The problems of a large land area and large differences in elevation are compounded by the landlocked position of the country. It is bordered by five other countries: Peru, Chile, Argentina, Paraguay and Brazil. It still has no paved road access to any of its neighbor countries. Its access to deep water ports is limited by long distances (between 460 to 3,100 km depending on the route and point of origin) and poor transport infrastructure.

1.7 The consequence of the geographic condition is that Bolivia has to spend considerably more on transport to produce every dollar of GDP than most countries. It has been estimated in 1988 that road users spend US\$0.7-0.9 billion per year on vehicle operating costs and rail users spend a further \$40 million. In total this is equivalent to 19-24% of GDP. The corresponding figure in many developing countries is only 12-13% of GDP.

1.8 The second issue is the poor condition of the existing transport network caused by poor management and policy decisions of the past transport administrations. Due to lack of maintenance, 35% of the paved and 76% of the principal gravel road network have deteriorated into poor-bad condition. To compound the problem, planning of transport investments has been haphazard and poorly coordinated; with new construction being emphasized over maintenance of the existing network; building new roads with lower economic priority while segments of the main La Paz-Cochabamba highway have remained unpaved; and

likewise, incomplete improvements to several alternative export corridors (road and rail) have been undertaken, whereas concerted efforts to achieve one or two efficient routes would have been more profitable.

1.9 The third issue is the location of the transport network. Existing infrastructure is, to a significant degree, in the wrong part of the country for future needs. In the past Bolivia made its living from mineral exports and the corresponding transport network was developed to support the industry. The highlands, where the mines are located, have one-sixth of the land area of Bolivia, but contain over one-third of the total rail and road network. With the decline in the dominance of the mining industry, future economic prospects require that the economic center of gravity shift from the highlands, where half of the population now lives, to the lowlands still largely unpopulated and devoid of transport infrastructure. Furthermore, past transport investments have focused primarily on the rail network. The development of the road network is still at an infancy stage where the central highway connecting the three major cities of La Paz (highlands), Cochabamba (valleys) and Santa Cruz (lowlands) is not yet completely paved. The rural road network, particularly in the valleys and the lowlands is sparse and underdeveloped to link the rural agricultural communities with the main urban centers.

C. Management and Regulation of the Transport Sector

1.10 The Ministry of Transport, Communications, and Civil Aeronautics (MTC) is responsible for managing the transport and communications sector, including all land transport modes and civil aviation, but excluding maritime and river transport, which is managed by the Ministry of Defense. MTC is responsible for managing the principal transport agencies: the national roads agency (SNC); the railway authority (ENFE); the national airports authority; and the national airline, in which the state has a majority interest. MTC also has responsibility over the national telecommunications company, ENTEL; and the post office (see Chart I). Annex 1 describes in more detail the present structure of MTC.

1.11 The regulatory framework and the policies covering the transport sector is set out in the Supreme Decree 21060 of August 1985. Bolivia has gone from one of the most regulated transport systems in South America in the 1970s to that of the least regulated. With few exceptions, entry into road, water and air transport is free, and pricing is left to negotiation between operators and users. The prices of transport fuels were raised to border prices and they have been kept high since then. The only exception concerns urban passenger transport pricing, authority over which is delegated to municipalities.

D. Structure of Past Transport Investments and Government Policy

1.12 Over the past few years, 25 to 30% of the total public investment program has gone to the transport sector (see Table 1). The sector has consistently received the second highest allocation of public investment after the hydrocarbons sector. Within the sector, roads have received a big share of the funds, averaging 47 to 85 % per annum, followed by the railway. However, as discussed in Chapter II, the nature of investments within the sector have been poor and require major change in the planning strategy.

BOLIVIA: Past Public Investments in Transport (US\$ million)				
	1987	1988	1989	1990
TRANSPORT	86	114	118	82
Railway	15	22	19	8
Roads	63	65	68	70
Civil Aviation	2	17	16	4
River Transport	6	10	15	0
TOTAL PUBLIC SECTOR INVESTMENT				
Transport % of Total	28%	30%	31%	23%

1.13 The Government's basic investment priorities are to:

- (a) maintain and rehabilitate the existing road and rail networks;
- (b) integrate the three main populated areas of the country by rehabilitating and paving sections of the La Paz-Cochabamba-Santa Cruz highway still in poor condition;
- (c) complete two export corridors; one to the Atlantic and one to the Pacific; and
- (d) construct penetration roads in the lowlands to areas of high agricultural potential.

We elaborate on these strategic priorities in Chapter II.

E. The Transport Sector

1.14 Railways. The railway network of some 3,650 km is in two separate networks. The Andean network of about 2,270 km, in the Altiplano, was the first to be constructed in the latter part of the last century and first part of this century. Its principal purpose was to transport mining products to the Pacific Ocean ports of Antofagasta and Arica in Chile, but it also links to the Argentinean railway at Villazon in the South and, by means of a ferry service on Lake Titicaca between Guaqui and Puno, to the Peruvian railway. The Eastern network, now of about 1,377 km linking Santa Cruz with Brazil and Argentina, was built between 1950 and 1980. Further construction towards Trinidad in the north has made little progress and appears to have been abandoned. The two rail lines are not connected in Bolivia. The only rail connection between them is via a 650 km link on the network of the Belgrano Railway in Argentina.

1.15 In addition to the components financed under the Export Corridors Project (ECP), the current Railway Investment Plan involves rehabilitation of the link from La Paz to Guaqui, to connect with the Peruvian railway via the ferry on Lake Titicaca (the link was washed out when the level of the lake rose by 2 meters), rehabilitation of diesel locomotives which have passed the time for

their half life reconstruction and equipment for a new intermodal terminal in Santa Cruz. Any significant additions to the Investment Plan current at the time of signing the ECP require the consent of IDA. The investment plans for the next three years involve a total of US\$30 million on deferred maintenance activities.

1.16 ENFE covers all its costs without subsidies from the national Government. However, this is largely due to large cross subsidies from freight to passenger services, made possible by the lack of competition from the road transport for freight services. This position will erode in the coming years. In the past, the railway also suffered from excessive government intervention in pricing. A performance contract signed between ENFE and the Government in 1991 goes a long way toward clarifying mutual responsibilities and ensuring the railway's financial autonomy. Furthermore, under the ECP, ENFE signed in November 1991 a technical assistance contract with Canadian National (Railways) Corporation (CANAC) for three years to provide a full-time team to help ENFE operate the railway and make the transition to a more market-oriented operation and train its managers in modern methods of railway management and operation.

1.17 While ENFE has been making modest improvements in its financial performance over the past three years, the results for 1991 were exceptionally good. The company surpassed its monthly revenue targets (set under the 1991 Performance Contract) by a substantial margin and achieved a working ratio of 83% covenanted under the ECP. However, given that its revenues are dependent on so many exogenous factors (e.g., quantities of agricultural crops harvested in any given year, international market for Bolivia's export crops, etc.), its efforts to reduce overhead costs must continue. In that context, the retirement of 1,000 employees during 1991 and the dismissal of another 1,000 employees planned for 1992 (more than 35% in total) should help strengthen the company's finances.

1.18 There have also been improvements in ENFE's operational performance in 1991 over 1990, as measured by indicators such as locomotive availability, total train-km, average net train-load, and freight car availability. All operational targets under the 1991 performance contract were also met. However, there is ample room for improvement, and it is hoped that the program with CANAC will lead to large gains in operational efficiency.

1.19 Airports. The lack of adequate land transport links has placed emphasis on air transport (important to passengers though not to freight) as a means of communication. A vast area of the north east of Bolivia, comprising the departments of Beni and Pando and parts of La Paz and Santa Cruz, were for many years totally dependent on air transport for their links with the rest of the country. There are many airports and airfields in use by civil aircraft. Seven airports have paved runways capable of accepting B727-100 or equivalent aircraft, and nine more, with gravel or compacted earth runways, can accept F27 or equivalent aircraft. A further seventeen airfields are maintained by the National Airports Administration (AASANA).

1.20 The three principal airports are Santa Cruz, constructed at a cost of US\$30 million in the late 1970s with Japanese financing, Cochabamba, currently being reconstructed with Italian financing in a project with a total cost of more than US\$109 million, and La Paz, recently the subject of a study financed with Japanese aid that recommended substantial reconstruction and expansion at a cost

of US\$138 million. It is probable that a less ambitious reconstruction will be started within the next few years.

1.21 As with the land transport modes, lack of finance has inhibited development and adequate maintenance of airport infrastructure. The investment plans for more new development will put even greater pressure on the scarce funds available for maintenance of existing facilities. Investment plans for the next three years include only US\$15 million for preventive maintenance activities but more than US\$250 million for new projects. No distinction is made in funding sources for the two activities, the revenues from user charges being used to contribute to both operating and capital costs.

1.22 The national airline, Lloyd Aero Boliviano (LAB), is currently being put up for joint venture to inject fresh capital into the operation and to improve its management. A commission, appointed by the Minister of Transport, is analyzing a study from a US consulting firm to privatize LAB. The conclusions and recommendations of this analysis will be known in late March, 1992.

1.23 River Transport. Given the lack of funds for investment in more capital intensive transport modes, it is surprising that more use has not been made of river transport. Little use is made of the extensive river system in the north east region, just where accessibility by road is most difficult. Developments of new roads in the region are intended to replace river transport rather than to complement it.

1.24 A new port was built on the Ichilo River at Mamore, but its usefulness was short-lived once it was by-passed by the new road between Santa Cruz and Trinidad. It is possible but unlikely that the importance of Trinidad as a port will increase following the construction of the road.

1.25 The Paraguay River provides the only direct maritime link between Bolivia and the open sea, but for fifty years, until the construction in 1989 of a private port at Quijarro, there was no way of making use of this route to the sea. Now that the port has been completed, it is greatly under-utilized. It functions more as a transfer point between road and rail for goods destined for the Brazilian port of Paranagua than as a river port for goods to and from the River Plate ports of Buenos Aires, Rosario, and Nueva Palmira.

1.26 In general, transport on the Paraguay River has not increased as much as was hoped. There are four principal reasons for this. First, agricultural production in Santa Cruz has increased more slowly than expected; second, climatic conditions during 1991 were very unfavorable for harvests; third, the world price of soya has fallen to a level where production in Santa Cruz is only marginally profitable at present transport costs; and fourth, an alternative export corridor, by rail through Argentina to a private soya terminal near Rosario, has become the main export corridor for Bolivian soya. Furthermore, river transport itself has not yet increased in efficiency as much as was expected, resulting in relatively high transport costs. In addition, the overvalued exchange rates of Brazilian and Argentinean currencies make transport costs by their barge trains very expensive. Finally, but perhaps most significant, ENFE's operations on the Eastern network between Santa Cruz and

Puerto Quijarro have still not been efficiently organized to provide a low cost and reliable service.

1.27 The only planned significant public investment in the river transport sector is for a new port at Puerto Busch at the southern extremity of Bolivian territory on the Paraguay River. Progress on this project depends on the prospects for development of the mining project at Mutun, and it should be considered as a component of this industrial project rather than as a transport sector project.

II. ROAD TRANSPORT

A. Traffic and Vehicle Fleet

2.01 The most densely trafficked road sections are shown in Table 2. Of the nearly 13,000 km of road over which traffic counts are taken, more than 6,600 km (50%) carry less than 100 vehicles per day. There are less than 60 km of roads carrying more than 3,000 vehicles per day and less than 1,150 km (10%) carrying more than 500 vehicles per day.

2.02 Traffic has grown erratically over the last ten years, a period of economic instability followed by a period of stagnation. From 1982 to 1989, the average rate of traffic growth was 3% per year. The highest rate recorded, 15%, was in the period of greatest economic instability, in 1985 and 1986. The period of negative economic growth was also a period of negative traffic growth, a 6% reduction in traffic being recorded from 1987 to 1988.

2.03 By 1990 the road vehicle fleet numbered 44 vehicles per thousand population. Its apparent growth during the 1980s has been faster than the growth in the economy (Table 3). The figures must be interpreted with caution, however, as there has probably been an accelerated rate of withdrawals from the fleet that has not been reflected in the estimates of fleet size. The apparent growth in numbers of trucks has been even greater than the growth in the fleet as a whole, but is subject to a similar caution in its interpretation.

B. Vehicle Operating Costs and Utilization

2.04 The structure and level of vehicle operating costs have both changed since the last detailed investigation in 1983. Fuel charges have increased so that now they are well above opportunity costs (Table 4), whereas in 1983 they were heavily subsidized. Financial costs have also increased, and interest rates are well above inflation instead of being negative in real terms, as they were in 1983. New vehicle prices are now at international levels, whereas in 1983, Bolivia was a market for vehicles at prices below those in their country of manufacture. All these factors have tended to increase vehicle operating costs above their already very high levels. The only factors working in the opposite direction have been an improvement in vehicle utilization and a change in the type of truck being operated.

2.05 Vehicle utilization has improved with the elimination of the monopoly of freight transport previously accorded to the transport syndicates. As a

result of the elimination of the monopoly, several cooperatives and transport companies with access to bank loans and other private funds have been able to purchase five-axle semitrailers. Road tariffs now reflect actual economic costs. Tariffs for long-distance truck-load hauls are of the order of US\$ 10 to 15 cents per ton/km, about double the rates in Brazil, Chile, and Argentina. At least three factors contribute to these high tariffs. The difficult terrain in much of the country will always result in higher vehicle operating costs and hence higher tariffs than in neighboring countries. Lack of suitable backhaul loads will require higher tariffs to cover total vehicle operating costs for the foreseeable future. The deteriorated condition of the road network also results in high vehicle operating costs and high tariffs. The impact of this cause of high tariffs will reduce as the network is improved, particularly in the main export corridors with the construction of Patacamaya-Tambo Quemado, the reconstruction of La Paz- Oruro and the construction of La Paz-Cotapata (see map). The opening in 1988 of the new road between Cochabamba and Santa Cruz has already significantly reduced road freight tariffs between these cities. Nevertheless, the vehicle fleet still includes many two and three axle trucks with high operating costs. As these are replaced by more efficient larger trucks, operating costs and tariffs will be reduced in the competitive environment now prevailing.

C. Road Infrastructure

2.06 The national road network consists of 41,686 km (December 1989), of which only 1,776 km are paved (4%), 10,942 km are of gravel (26%) and 28,968 km are earth surfaced (70%) (Table 5). For administrative purposes this network is divided as follows:

Network	Paved	Gravel	Earth	Total	% Poor
Primary	1,372	4,058	620	6,050	69%
Secondary	90	2,721	1,879	4,090	82%
Feeder	122	4,360	26,464	30,946	94%
Total	1,584 *	11,139	28,963	41,686	89%

* Excludes 192 km of paved roads, whose pavement disintegrated.

2.07 The most recent information on the network condition (Table 6) indicates that only about 11% of it can be classified as good or fair, 38% as poor and the remaining 51% as very bad. (The last category includes all roads, more than 21,000 km, that cannot be efficiently maintained for lack of drainage and inadequate geometric conditions). Therefore, at least 40% of Bolivia's network is in a condition where rapid intervention, to prevent further deterioration, will avoid the need for later expensive reconstruction. Furthermore, much of the Bolivian cordillera (mountain range) is still geologically very young and subject to rapid erosion through landslides. This causes a major need for emergency road and bridge works every year during the rainy season.

2.08 Of the 1,776 km of paved roads, 744 km (42%) were constructed before 1970, 615 km (35%) were constructed between 1970 and 1980 and 407 km since 1980.

However, although much of the paved network has been built in the last twenty years, lack of maintenance and lack of control over vehicle axle loads have resulted in such a rapid deterioration that most of it now needs to be rehabilitated or reconstructed. As an example, about 190 km of paved roads were downgraded to gravel roads in recent years. Until IDA (under the ECP) financed rehabilitation of the El Alto to Oruro highway (begun in August 1990), almost no reconstruction, rehabilitation, or resurfacing had been undertaken. The 77% of paved roads (1,359 km) more than ten years old can therefore be expected to require some form of resurfacing or rehabilitation in the next few years. The gravel network has suffered from similar neglect and is also in need of substantial rehabilitation or reconstruction (see following table).

Condition of Primary and Secondary Road Network					
Network	Good	Fair	Poor	Total	% Poor
Paved	124	808	530	1,462	36%
Gravel	14	1,559	5,206	6,799	77%
Earth	-	238	2,261	2,499	90%
Total	138	2,605	7,997	10,740	74%

2.09 In the past, road maintenance has suffered from: (a) inadequate planning and programming by SNC; (b) budgetary allocations which have been below requirements and were subsequently further reduced to fund some road construction; and (c) lack of correspondence between budget allocations and actual release of funds. The proposed Second Road Maintenance Project incorporates the above lessons of experience by: (i) strengthening road maintenance administration (re-structuring SNC's maintenance organization); (ii) improving maintenance planning and operations (through a program of maintenance by contract and another program of maintenance by force account); and (iii) helping sustain the road maintenance programs beyond the project horizon by assuring that enough resources are allocated and spent on maintenance in the following 5-6 years (1996-2001).

D. Road Administration

2.10 Planning, engineering design, construction, and maintenance of roads are, at present, the responsibility of the National Road Authority (Servicio Nacional de Caminos - SNC), a semi-autonomous institution financed largely by government transfers. SNC was set up in the 1960s with financial and technical assistance from the US Federal Bureau of Roads. An efficient institution in the late 1970s, its effectiveness was impaired by the economic and political crisis between 1981 and 1985. Recently, SNC has recovered most of its technical capability, supported by technical assistance financed by international donors and lenders. But SNC's future challenges lie mainly in improving its planning and management capacity for road maintenance.

2.11 The staff of SNC are divided into three principal divisions: Planning, Operations and Administration (see Chart II,a). The total staff includes 208 engineers, 420 administrators, 492 other professionals and 2,737 unskilled employees, a total of 3,857, most of them direct account workers. The small proportion of administrative staff (17%) is misleading, as many of the professional staff are employed for what are really administrative tasks. Similarly, the apparent high number of qualified engineers gives a misleadingly optimistic impression of the technical capacity of SNC.

2.12 Maintenance of the road network is carried out by SNC's maintenance department (MD), which reports to the Operations Division. The department comprises four sections at the central level: planning and control, maintenance technology, human resources and projects. A new unit, the Project Execution Unit (Unidad Ejecutora del Proyecto - UEP) was created in 1989 to coordinate the implementation of externally financed projects. Force account activities are controlled through ten districts, reporting directly to the Operations Division. Road maintenance equipment and workshops are supervised and coordinated by the equipment department (ED), which also reports to the Operations Division, and is composed of five units: supervision, procurement, central workcamp, workshops and El Alto Unit. The entire organization totals about 3,170 people, of which 237 are at the central level. The rest work in the districts. The number of manual staff and the existing equipment are sufficient to carry out all the required maintenance work, except in emergencies and some specific works (i.e. bridge repair). In these cases, their work is complemented by the direct hiring of local contractors.

2.13 SNC has recently put into use a formalized maintenance management system and equipment maintenance system (known by their Spanish acronyms SAM and SAE, respectively). With the implementation of the proposed Project, the workload of the Maintenance Department will permanently increase, beyond the capacity of the present numbers of staff. However, the implementation of the SAM and the SAE will limit the increases in professional staff needed and will create opportunities for reducing administrative and non professional staff. During negotiations, MTC agreed on a new organization structure and staffing plan for SNC, acceptable to IDA. The staffing plan takes account of the efficiency changes possible after the implementation of the SAM and SAE, the increased workload in the short term arising from the implementation of this Project, and the eventual reduction in size of the network for which SNC will be responsible. These factors will be also taken into account for filling vacancies produced by retirement, resignation or firing.

2.14 Traditionally, external financing to SNC has mainly been allocated to acquisition of maintenance equipment and to construction programs requiring new equipment (not suitable for maintenance activities), that is transferred to SNC at the end of the programs. As a result, SNC has a fleet of 1,672 items of construction and maintenance equipment ready for operation and about 1,500 old units to be sold at auction. The loans, credits, and donations already approved have allowed SNC to purchase 466 new units in 1990 and 1991 (some of them under IDA's RIC-II, Credit 1828-BO) that will gradually replace old units. However, SNC has a shortage of current funds to operate such a fleet satisfactorily. Therefore, SNC has agreed not to purchase further equipment as its current road

maintenance fleet, including recent purchases, is large enough to carry out the 1992-95 maintenance program by force account.

2.15 Equipment management was poor before 1991. Many units are in poor condition because they were not properly operated and maintained. SNC's capital investment in equipment must be better protected by observing regular preventive maintenance. With the implementation of the SAE, SNC will be able to achieve satisfactory programs for equipment rehabilitation, repairs and maintenance, matched to the real needs arising from the road maintenance programs. Furthermore, the existing structure for equipment administration must be strengthened and the operators should be trained under a program within SNC. Due to the lack of tenure in operator positions, the training program should be permanent. This Project includes such a training program for equipment operators and SAE users.

2.16 So far, maintenance activities have been dominated by activities connected with new construction/reconstruction within the Operations Division. The labor forces in the districts have been frequently involved in programs of road reconstruction and new construction financed by international and regional institutions, in part due to the lack of timely resources (fuels, asphalt) to carry out maintenance programs. These labor forces are necessary in a country with the characteristics of Bolivia, with large and sparsely populated areas (where there are no contractors interested in maintenance works), with frequent landslides and other road and bridge emergencies, and with half of the network in such condition that is not properly maintainable but must be kept passable as long as possible. However, these forces should only work in maintenance activities, leaving the works on road reconstruction and new construction to the contractors.

2.17 The implementation of this Project will mark a change in emphasis of activity of SNC, with a greater emphasis being put on maintenance. For this purpose, within the new organization, SNC will establish a maintenance branch, separate from engineering and construction. This new branch will be responsible for all maintenance activities and include the maintenance department itself, a new bridge maintenance unit, the equipment department and the ten districts. It will not report to the Operations Department, but directly to the deputy executive director. The existing equipment management unit, within the equipment department, will be strengthened, and each of the ten districts will have a chief maintenance engineer (see Chart II, b). Furthermore, the Project includes detailed maintenance programs, agreed with the Government during negotiations, and will provide the necessary financing to carry out these programs. The agreed maintenance programs will ensure that personnel is used efficiently and that maintenance costs carried out by force account are reasonable.

E. Road Strategy

2.18 The Government has no rigorous strategy for roads. It responds to widespread political pressures and aspires to undertake much more than is feasible. Nonetheless, in its dialogue with IDA, the Government has recognized that its priorities fall broadly into the four categories listed in para. 1.13: maintenance, interconnecting the main cities, upgrading export corridors, and providing access to regions of high agricultural potential. Furthermore, there

is no clear investment strategy for the secondary and rural networks and none is likely to emerge until the road decentralization is confirmed and the roads to be transferred to the regional institutions are known. The Project tries to strike a balance between the needs for additional investments to provide improved access to the substantial part of the population which is still deprived of adequate infrastructure, and the need to maintain the existing network in good condition. This has been achieved by preparing a Road Investment Plan and a rolling Maintenance Program. The preparation of this plan and program has entailed an iterative, and at times difficult, process of reducing a long list of desirable projects to fit available financial and administrative capacity. The central objective is to achieve, towards the end of the decade, the following goals:

- (i) reconstruction of all justifiable paved roads by 1996, the completion time of the proposed Project.
- (ii) upgrading the paved network to 100% in good/fair condition and the gravel network to 70% in good/fair condition by 1996 (meaning that a substantial part of the backlog in maintenance will have been eliminated);
- (iii) reconstruction of all justifiable non-maintainable roads that are essential to complete the trunk network or to provide access to the areas of high agricultural potential, by 2001;
- (iv) routine maintenance on the already maintainable network and the roads that are upgraded or reconstructed.

F. Road Investment Plan

2.19 In the absence of a formal plan prepared by the Government, a tentative Investment Plan for 1992-1996 was prepared by the appraisal mission and discussed with all three relevant ministries (Transport, Planning and Finance). The Plan considered both income and expenditure and took into account the SNC's technical capacity to implement the plan, the capacity of the Government to make available counterpart funds, and the implementation capacity of the construction industry (see para. 2.41). Based on this plan, MTC prepared for negotiations a modified version taking into account a reduction, early in 1992, in the number of projects to be financed by IDB. A review of this Plan is provided in Annex 2.

2.20 A review has also been made of the economic evaluations of subprojects included in the Investment Plan. SNC has no permanent planning unit capable of undertaking prefeasibility studies. Therefore, all project evaluations so far have been made by consultants and all used the Bank's Highway Design and Maintenance model (HDM III). The economic rates of return obtained so far for new construction subprojects are generally low, 11 to 28%, even taking account of the favorable assumptions made about traffic growth (3% to 9%) and construction costs. However, they do not include the benefits of generated traffic, which will be the major source of benefit for most new construction projects. Reconstruction subprojects show much higher rates of return, generally between 20% and 50%.

2.21 The agreed new organization structure of SNC (paragraph 2.13) includes a unit for undertaking prefeasibility studies of potential projects. These studies will assist in updating the Investment Plan and in determining which projects should be subjected to more thorough evaluation.

2.22 The Plan would require a total investment of US\$832.8 million over the six-year period. The annual average investment would be US\$166 million, with a maximum of US\$227 million in 1993, far more than the budgeted investment of US\$63 million in 1991 (see Table 7). This annual total of about US\$165 million is about 30-35% of the likely total public investment (all sectors combined) and about 2 1/2 - 3% of GDP, high by any standard. However, although the Plan would require a large increase in total investment, only a small proportion of the total investment cost would represent an immediate call on treasury funds (to provide the counterpart requirements and to service the overseas debt). Thus the Plan would be within the financial resources of the Treasury and the planning and management capacity of SNC. Most of the increase in 1992, 1993 and 1994 is for already committed projects.

2.23 The total investment of about US\$833 million, for 1992-1996, includes expenditure of about US\$14 million for studies, US\$560 million for projects in new construction and reconstruction (more than 50% already committed), US\$9 million for bridges, US\$32 million for rural roads and US\$218 million for rehabilitation and periodic maintenance by contract (see Table 7), of which about US\$85 million corresponds to periodic maintenance by contract to be financed by this Project. This means that construction and reconstruction account for about 67% of the total. Though a large share, this is acceptable at Boliva's stage of development, given the underdeveloped state of the existing network and the need for high expenditure on improvement and reconstruction. Maintenance and rehabilitation account for 26% of the total and include all economically justified periodic maintenance and rehabilitation.

2.24 The four most expensive single projects in the Plan, together accounting for 60% of the total investment cost and 85% of the cost for new construction, are:

- (i) Patacamaya - Tambo Quemado (total cost US\$92 million, 82% in the plan period), co-financed under the Export Corridors Program, is to provide road access to the Chilean port of Arica for the first time. The present track is non-maintainable, due to its very bad geometric conditions and its lack of pavement and drainage;
- (ii) Cotapata - Santa Barbara (total cost US\$ 192.5 million, 50% in the plan period), an extension of the Pacific export corridor into an underdeveloped region of the North East with great development potential for the production of export products (particularly citrus fruits and beef). This road is in very bad geometric condition in very difficult terrain, lacks drainage, signalization and safety rails and, as a consequence, has a high rate of accidents and mortality. IDA recognizes that this road, while exceptionally costly, is warranted in view of its likely development impact. However, the Government will need to pay particular attention to keeping costs down;

- (iii) San Borja - Trinidad (US\$ 90 million, 20% in the plan period), a further extension of the same corridor to the northern lowlands, which will provide greatly improved access to an under-developed region. The present unpaved track is under water during the whole rainy season (two to three months per year); and,
- (iv) Reconstruction of Chimore - Yapacani (US\$ 125 million, 78% in the plan period), improving access to the recently completed new highway between Santa Cruz and Cochabamba and forming part of the export corridor from Santa Cruz to the Pacific Ocean ports.

Furthermore, the section Rio Seco-Desaguadero is one of the top government priorities, especially after the agreement reached with the Peruvian Government in February 1992 on the use by the Bolivians of the port of Ilo in Peru, as a free port. The works in this case are mostly rehabilitation and the project was evaluated during the preparation of this Project with positive results. However, it was not included in the Project due to its relatively high cost (US\$35 million), which exceeds the limits previously established for works to be included in the Project.

2.25 The principal criteria used in selecting these and other new construction projects for inclusion in the recommended investment plan were that: (i) they should form part of an export corridor and make a clear contribution to a rapid improvement to the volume and value of exports; and/or, (ii) they should improve access to areas of high agricultural potential.

2.26 During negotiations, the Government and IDA agreed on the Investment Plan for 1992-96. The agreement includes annual reviews (in light of the results of the economic evaluation studies to be undertaken by SNC) and guidelines for any substantial modification (any modification which will change the projected treasury expenditure by more than 10% of that planned for the year). Given the variety of funding sources for the Investment Plan (see Annex 2, paragraph 10), the annual reviews will include an assessment of success in coordinating this funding and proposals for remedying any deficiencies.

G. Road Maintenance Programs

2.27 No comprehensive maintenance planning was practiced before 1990. Traditionally, the data for budget preparation was generated in the headquarters of SNC, with very little quantitative input from the field operating units. The budget format was very general and not based on any measure of expected work performance. In recent years, the Government, compelled by the road maintenance level required by the ECP, has made efforts to allocate funds to improve road maintenance. The corresponding allocations under the current account increased from US\$18 million in 1988 to US\$20.2 million in 1989, and US\$23 million in 1990 (US\$29 million including about US\$6 million for purchases of some units of equipment). The average expenditure on road maintenance, in 1990, of US\$570 per km (considering the entire network) or US\$1,1224 per km (considering only the 20,500 km properly maintainable) was not enough to cover periodic maintenance, so less than 11,000 km received adequate maintenance.

2.28 The approved budget for current expenditure on roads in 1991 was about US\$22 million. It represents a significant effort, (about 30% of the total road expenditure budget, capital and current) but is still a low amount, especially if we take into account that approximately US\$12 million is for salaries and about 20% of these salaries are for people who, actually, are not working on road maintenance. In recognition of the inadequacy of the funds allocated to road maintenance, the National Treasury transferred to SNC, in the second half of the year, an extra US\$4.2 million for the maintenance program. These facts and figures confirm the need to prepare adequate maintenance programs and budgets and to establish an appropriate control system.

2.29 In 1989, SNC started implementing the SAM and the SAE in the five southern districts under CAF financing and extended the implementation to the other five districts under the Export Corridors Project. The systems entail a systematic programming of maintenance operations according to standardized frequencies, budgeted using standard unit costs and productivity levels. These standards had to be calibrated and the roads inventoried as to their condition. Adjusting the standards and productivity levels to the available budget is necessarily an iterative process. Relevant data have to be collected and analyzed at both local and central levels. The systems were fully implemented by January 1992. After their implementation, the SAM and the SAE provide the means to improve the maintenance budget process. Consequently, for the first time SNC is now able to submit and implement a road maintenance budget based on specific types and quantities of work to be accomplished. The maintenance programs prepared using the systems establish requirements for labor, equipment and materials. The systems will also be used for monitoring the maintenance actually performed and for determining future maintenance budgets.

2.30 During project preparation, the general principles of the SAM and the SAE have been used in preparing the annual road maintenance programs by force account for 1992-1995 (Annex 3) totaling US\$ 131.5 million (US\$33 million per year as an average) and the equipment rehabilitation and operation programs (Annex 4). These programs (reflected in the projected current budgets, Table 8) will contribute to eliminating the backlog in maintenance in the network that is now maintainable or has been recently rehabilitated or reconstructed and will initiate a normal process of maintenance. The Project also includes an agreement on adequate funding and administrative arrangements, including a new SNC budget structure, to ensure that the allocated funds are indeed used in maintenance.

2.31 Since opinions vary on the relative merits of maintenance by contract and by force account, the proposed distribution of maintenance activities will allow the cost and quality of the two approaches to be compared, as a first step to reaching an agreement on the private and public shares of maintenance. The transition from force account to contract maintenance will have to be gradual, in a country with the characteristics of Bolivia (see para. 2.16).

H. Impact of the Investment Plan and the Maintenance Programs

2.32 The following table shows the results expected from the proposed Project and the on-going and proposed programs for road reconstruction, on the condition of the 20,500 km that are, at present, maintainable. The rest of the network will be kept passable. The non-maintainable roads that are viable will be upgraded in future plans, because this type of work is beyond the scope of this Project.

Actual and Planned Condition of the Maintainable Network (Km)				
	1991 Actual	%	1996 Planned	%
<u>Paved Network</u>				
Good/Fair	988	62	2,784	100
Poor	596	38	0	0
Total	1584 *	100	2,784 *	100
<u>Gravel Network</u>				
Good/Fair	2,801	25	6,749	68
Poor	8,207	75	3,256	32
Total	11,008 *	100	10,005 *	100
<u>Earth Network</u>				
Good/Fair	747	9	1,644	21
Poor	7,128	91	6,034	79
Total	7,875	100	7,678	100
<u>Total Network</u>				
Good/Fair	4,536	22	11,177	55
Poor	15,931	78	9,290	45
Grand Total	20,467	100	20,467	100

(*) 192 km of disintegrated paved roads will be restored and about 1,000 km of gravel roads will be upgraded.

2.33 As a summary, total expenditure on roads to date, while growing, has been insufficient to maintain the road network at an acceptable standard. When the level of total investment in maintenance proposed by the Project is reached, total road investment will be enough to stabilize the network in an acceptable condition, while staying within the projected financial capacity of the Government. Of this investment, periodic maintenance by contract will comprise about US\$218 million (including about US\$85 million financed by the Project), about 26% of the Investment Plan. Maintenance by force account (including salaries) will add a further US\$132 million (US\$33 million per year as an average), adding a further 14% to the total road budget. Of this last amount, about 70% will be for routine maintenance, 24% for some periodic maintenance and 6% for emergencies. The total maintenance expenditure will then be about 40% of the total road budget, an acceptable percentage in a country that is far from completing its principal network.

INVESTMENT PLAN AND MAINTENANCE PROGRAM

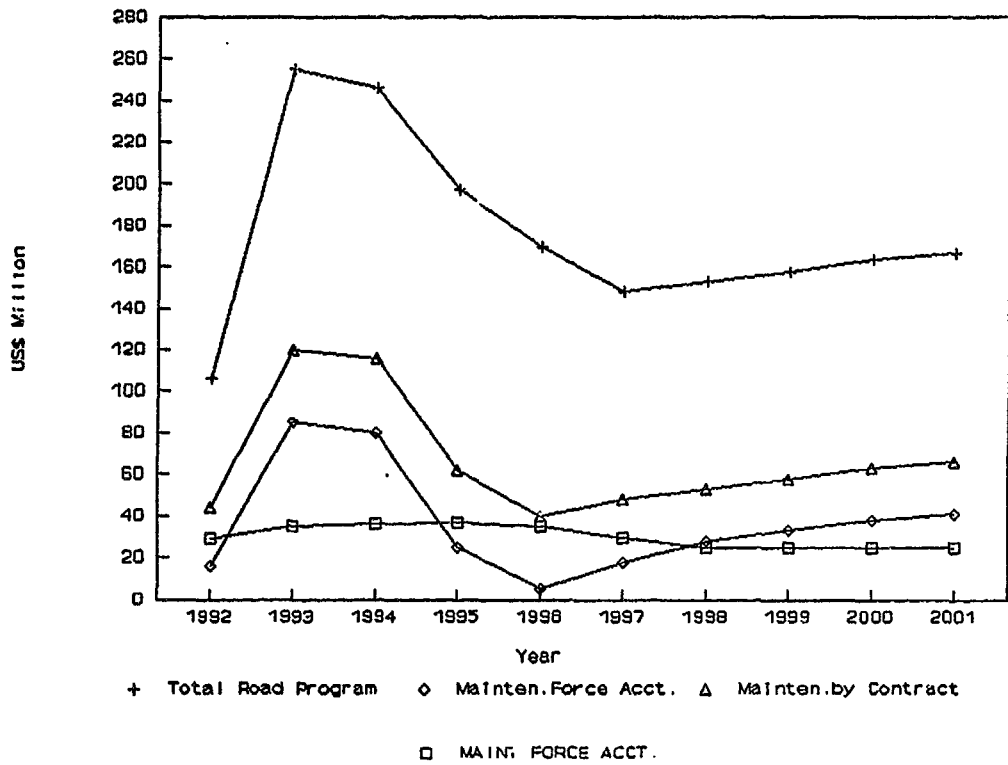
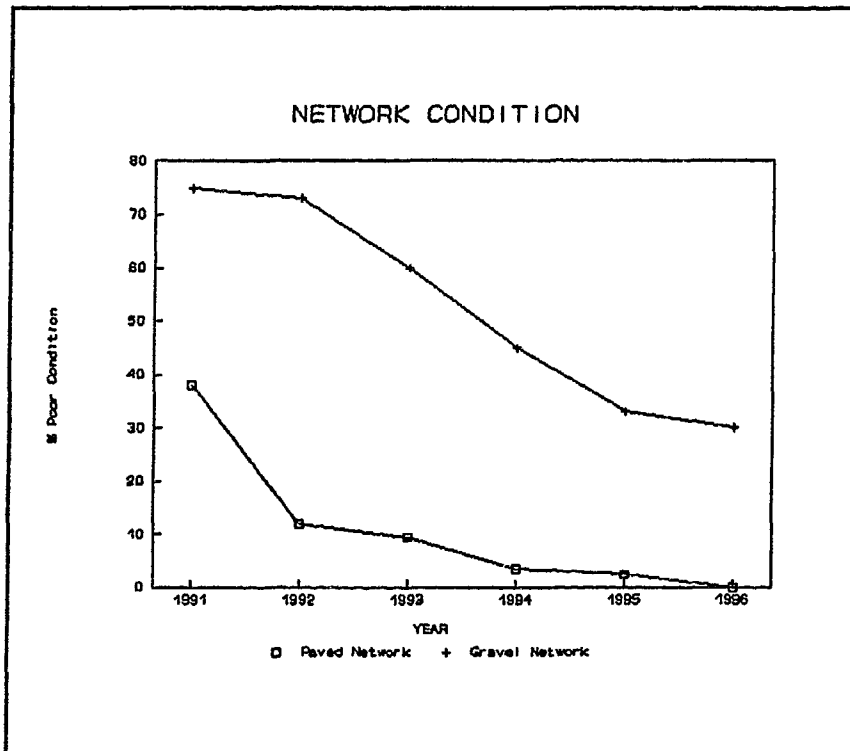
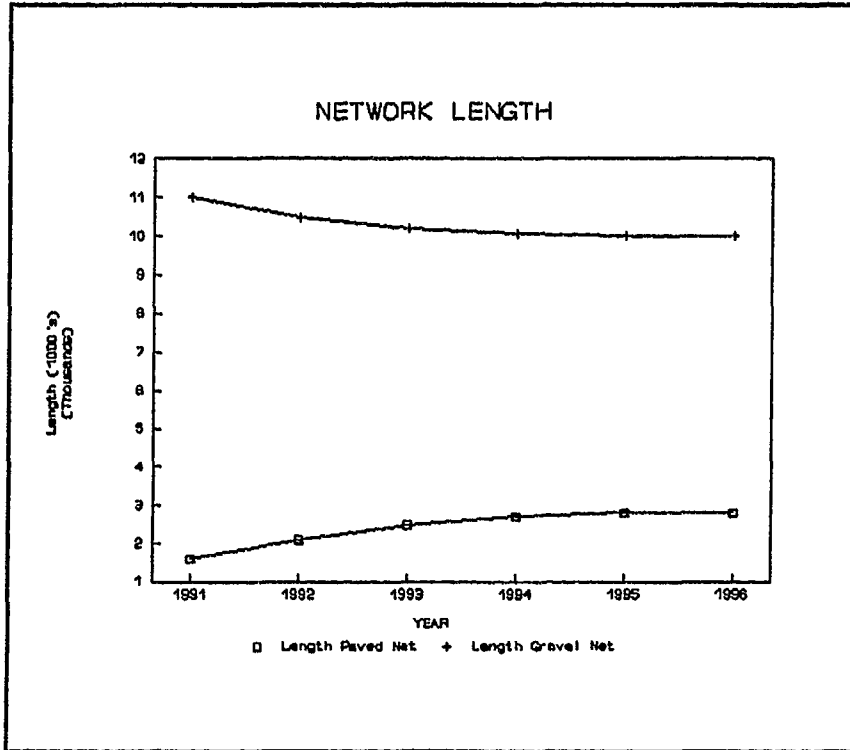


Figure 2



I. Road Financing and User Charges

2.34 The measures set out above will, in the future, improve SNC's planning, budgeting and operations but they do not guarantee that enough funds will be allocated to maintenance and rehabilitation and that the funds promised will be actually delivered. In the past, almost all the available investment funds have been used for new construction rather than for periodic maintenance (Table 9) and the recurrent funds made available have fallen short of allocations sometimes because tax collections have fallen short of target and sometimes because the funds have been diverted to new construction. The administrative restructuring to separate maintenance from construction should, to a certain degree, reduce the incidence of diversion but further measures are required to ensure a consistent and adequate flow of funds for maintenance. Otherwise, the maintenance activities could decrease after the Project (1996) due again to lack of appropriate funding and, as a consequence, the condition of the network would deteriorate and the main benefits of the Project would be lost.

2.35 The recommendation of the first phase of the Road Financing Study, completed in February 1992, was the creation of a road maintenance fund financed from dedicated user charges (a fuel surcharge, improved revenues from road tolls and additional charges for the annual vehicle licensing fees) to finance road and bridge maintenance. While the proposed fund would provide greater accountability for SNC and eliminate the possibility of the Government withholding adequate funds for maintenance, the measure, if approved, could be contrary to the objectives of the fiscal reform, and reduce competition for funds within the Government. Since it is expected that the SNC's planning and budgeting process will substantially improve with the Project, SNC will be able in the future to defend sound technical decisions, achieve adequate allocation of funds and demonstrate that the allocated funds are well spent. A professional assessment of the results of the maintenance program in the previous year and the evaluation of returns produced by the invested funds would be the basis to achieve approval for the allocation of funds in subsequent years. A period of two years will be necessary to check if the SNC's planning and budgeting improve as expected and how the Treasury operates in order to guarantee that the allocated funds are released in a timely manner. At the same time, the possible alternatives for financing road and bridge maintenance starting in 1996 will be analyzed in the second phase of the Road Financing Study, including the terms for establishing a possible road maintenance fund (terms of reference in Annex 5). At the end of the two years, the Government and IDA will assess again the situation and the recommendations of the study to decide if it is necessary to establish the fund before 1996 to guarantee adequate maintenance funding. In any case, an agreement will be reached by September 30, 1994 on the mechanisms for financing road and bridge maintenance for 1996 and thereafter.

2.36 Road users contribute to Government revenue through taxes and duties on vehicles, fuel, lubricants and spare parts and through fees for vehicle licenses, a capital transactions tax, and road tolls. The major parts of the road user revenues, by far, derives from fuel taxes and road tolls (covers 99% of total user revenues). The user charges on fuel generated about US\$80 million in 1991, or 89% of total road user revenues; road tolls generated additional US\$8 million in 1991. This amount adequately covered the variable economic expenditure caused by road traffic (i.e. maintenance and administrative budget) and the counterpart

funding cost for investments, and covered a portion of the debt service for past investment projects. In total, the road user charges covered 86% of the total expenditures on roads.

2.37 The current user charges, however, cause some distortions and inefficiencies. For the fuel tax, the current difference in the level of taxes applied to gasoline and diesel results in small vehicles paying much more in total user charges than their allocated share of variable maintenance expenditure, whereas heavy vehicles which use diesel fuel pay less than their variable maintenance expenditure:

Fuel Type	Consumer Price US\$/Liter	User Charge US\$/liter	User Charge as % of Consumer Price
Premium gasoline	0.59	0.30	51%
Regular gasoline	0.42	0.13	31%
Diesel	0.31	0.03	10%

For road tolls, the low average traffic levels, low toll charges, and high levels of toll evasion and leakage result in low gross revenues. A recent study estimated that with better administration and control, the revenue intake could increase up to US\$12 million per annum without an increase in toll levels or by to as much as US\$17 million with increases in tolls which would not significantly impact on volumes of traffic. During negotiations, agreement was reached that retail fuel prices will at least maintain their current margin above border prices plus distribution costs (the sum assumed to be equal to opportunity costs) throughout the period of the Credit. An attachment establishing the basis to monitor the fuel prices was also agreed.

2.38 Although the current road user revenues cover a significant proportion of the road expenditures, the actual requirements to properly develop and maintain the network require much higher expenditure, and hence revenues. The recurrent budget requirement to maintain a stabilized network after 1996 (or after project completion) will be about US\$65 million per annum (including administration, see Table 10). In 2001 a further US\$72 million per annum will be needed for amortization of current and proposed loans and US\$6 million for counterpart funding for new construction. The current user charge revenue of US\$89 million would be inadequate, even if all of it were to be allocated to finance road maintenance and construction expenditures.

<u>Required Expenditure</u>		
	1991 Actual	2001 Required
(US\$ million, constant 1991 prices)		
Investment (counterpart funds only)	73.1	6.0
Maintenance	30.0	64.0
Administration	3.1	2.8
Debt Service	42.5	72.4
TOTAL	105.2	145.2

2.39 There have been two recent partial studies of road user charges. The first study in 1988, carried out as part of the preparation for the Export Corridors Project, reviewed alternative ways of generating current toll revenues, and the more recent Road Financing Study (first phase) was concerned with road maintenance financing. The first part of Annex 5 includes a summary of the projection of maintenance expenditures required in the medium term (year 2001) made in the first phase of the Road Maintenance Financing Study. It also includes a summary of the recommendation for financing this level of expenditure.

2.40 In order to ensure proper project implementation and sustainability of project objectives, an agreement will be reached with the Government not later than September 30, 1994 on the mechanisms for financing road and bridge maintenance for 1996 and thereafter. Furthermore, in order to ensure an adequate budget allocation for maintenance during project implementation, it will be agreed at negotiations that IDA approval of the annual work programs and approval of new contracts will be contingent upon the Government meeting the following agreed recurrent budget allocation: 1992- US\$ 28.1 million; 1993-US\$42.2 million; 1994 - US\$46.1 million; 1995-US\$43.2 million; and 1996-US\$0.4 million.

J. Road Construction Industry

2.41 About 425 construction firms are listed with the National Chamber of Construction Companies in Bolivia, although a total of 1,285 private contractors executed works for the Emergency Social Fund (ESF) program, partly financed by the Export Corridors Project (2012-BO). The contractors not listed with the Chamber are characterized as "informal" construction firms, but more than 95% of the total number of these "informal" contractors that worked with ESF performed fairly well. Since most of the works of the program (those valued at less than US\$250,000) were directly contracted, it appears likely that ESF demand generated the formation of new construction firms and opened the door to small, informal contractors which had shied away from the laborious bidding process used by the public sector. This example shows the potential of the local construction industry to carry out small and medium-size projects, such as periodic and routine maintenance projects. The proposed Project will foster this potential

through a periodic maintenance program and a work compound construction program, both to be carried out by contract, which will be awarded under local competitive bidding (LCB) for all contracts under US\$2 million, totalling about US\$32 million (out of the almost US\$85 million financed by the Project). In addition, every year, SNC directly contracts to small local firms some emergency works, bridge repair and other specific works and in the future will continue to do so. Furthermore, the greater emphasis to be put on maintenance activities by SNC, as a consequence of the implementation of the proposed Project, will leave to private contractors many works in road rehabilitation and reconstruction, so far carried out by SNC's own labor force.

2.42 On the other hand, out of the seven contracts above US\$5 million awarded by SNC in the past two years, five were awarded to joint-ventures formed by a local firm and a foreign firm and the remainder two were awarded to one foreign firm (Brazilian). This is due to the lack of civil works to be contracted in the neighboring countries that forces the construction firms of these countries to bid for civil work contracts in Bolivia, at prices well below the SNC's prices of reference. To ensure that these low prices will not affect the quality of works, the proposed Project provides financing to contract independent consultants to supervise the works. Furthermore, the Project includes financing for a study to examine all remaining issues which constrain development of the local construction industry.

K. Road Decentralization

2.43 Decentralization of responsibility for road maintenance and construction is expected to begin in 1992. This decentralization would rationalize and improve the provision of services, and avoid duplications that now exist. It also would mobilize local resources in order to reduce the financial burden of the Central Government. The process of decentralization is now pending approval by the Bolivian Congress and there will be some delays due to administrative problems and lack of resources to implement the decentralization. In the meantime, IDA is financing, under the Export Corridors Project, technical assistance to SNC for preparing detailed terms of reference to develop a plan for road decentralization (see Annex 6). When the decentralization is approved and the detailed planning of the process is completed, it will be possible to implement the technical assistance, for SNC and the new road regional directorates, to be financed by the proposed Project.

2.44 Approximately only 8,000 km of roads (about 6,500 km of the existing fundamental network and an additional 1,500 km under construction, see Annex 6, Table 1) will remain under SNC's administration, according to the recommendations of a preliminary study completed in March 1990 under the IDA-supported Economic Management Strengthening Operation program. The rest of the network (about 33,600 km) will be transferred to the Regional Development Corporations, creating Road Department Directorates (Direcciones Departamentales de Vialidad-DDVs) in all of them. The organizational chart proposed for the decentralization of MTC is shown in Chart III. The basic organizational chart for the new DDVs is indicated in Chart IV. This will require the corresponding transfer of personnel, equipment, and resources to the regional corporations. The central administration will keep only supervision and control of the transferred roads,

to guarantee the fulfillment of technical guidelines and appropriate uses of the resources transferred (see Annex 6).

III. PAST BANK (IDA) EXPERIENCE IN THE TRANSPORT SECTOR

3.01 Prior to the two reconstruction and import credits, the Association's previous transport operations in Bolivia were limited to five credits signed in the period FY 1972 to 1978 (Table 11). Three were for railways (FY 1972, 1974 and 1977), one for road maintenance (FY 1978), and one for civil aviation (FY 1977). SNC had enjoyed extensive financial and technical assistance from the US Government from 1955 and from IDB in the 1970s. The absence of new IDA operations between 1978 and 1986 reflects the deterioration of economic management during this period.

3.02 The Bank's first involvement in the road subsector in Bolivia was the Highway Maintenance Project (Loan 1587-BO - Bolivia was an IBRD borrower prior to 1985, but reverted in this year -- because of its economic collapse between 1980 and 1985 -- to being an IDA-only country), for a total cost of US\$31.6 million including Bank financing of US\$25 million. The loan was approved in January 1978 and the project was carried out between 1981 and 1986. The loan was closed in December 1986, three years behind schedule and an undisbursed balance of about US\$14,000 was cancelled.

3.03 The project was designed to improve the capability of SNC for road maintenance and aimed to establish a gradual process starting from a pilot program. This was to be launched in the three more trafficked and very representative districts of La Paz, Santa Cruz and Cochabamba. This would be expanded to the rest of the districts by a national program. The project was also designed to prepare and implement the SAM and the SAE nationwide and to train SNC's personnel. An additional important component of the project was the National Transport Plan, for which the technical work was undertaken in 1979 to 1980 and the final report produced in 1981.

3.04 Project 1587-BO only partially achieved its objectives of implementing a wide maintenance program in the three districts named. The main cause of the deficiency was the economic and political crisis during the years of the project. Some implementation delays at the beginning, mainly in procurement and technical assistance, also reduced the benefits of the project. The major benefits were the new equipment provided under the loan, the design of the SAM by consultants and the maintenance of the high-volume roads in acceptable condition. However, these benefits were substantially reduced because the SAM was not really put into operation, and the maintenance of low-traffic roads was practically nonexistent and their deterioration overall was higher than before the project. Neither the design and implementation of the SAE nor the personnel training program were successful. This was mainly because consultants found it very difficult to engage suitable experts acceptable to SNC at a very difficult time in Bolivia.

3.05 As summarized in the PCR (Report No. 8673), the main lessons derived from this project are: a) social and economic stability are essential for the success of the projects; b) permanent and qualified staff are necessary in the institutions during project implementation; c) road maintenance projects must be

prepared and implemented guaranteeing continuity in maintenance activities and gradually establishing the necessary improvements and requirements; d) bidding documents for civil works, goods and technical assistance must be prepared as soon as possible, to avoid delays in the maintenance programs, acquisition of equipment and materials and in awarding consulting services that are basic to the good performance of the project; e) maintenance and equipment management systems must be designed in close collaboration with the institutions that will use them in the future and adapted to the capacity and real needs of the institution; f) detailed and well studied maintenance programs, considering all types of activities and affecting the entire network are absolutely necessary; g) maintenance programs must contain activities and standard parameters that allow them to be monitored and supervised; and, h) suspension and delays in disbursements can have very negative effects on road maintenance, with costly consequences, if much of the network is in or approaching the critical condition when pavement break-up begins.

3.06 The National Transport Plan (see para 3.03) provided the first comprehensive review of the condition of transport infrastructure in Bolivia, together with an assessment of the transport services offered and the demand for them. Projections were made for twenty-years, and detailed investment plans were produced for a ten-year period. Unfortunately the projections failed to identify the economic and social crisis that started almost as soon as the plan was published. This crisis reduced the possibilities of funding the proposed investments, which soon became little more than aspirations. Some further studies continued to be carried out by local consultants who had worked on the Plan, partly financed by the loan, until 1988. With the change in government, the National Transport Plan was terminated and its functions absorbed by the new Subsecretariat of Transport Planning. These have since been transferred to the Transport Planning Department.

3.07 There were no Bank projects in Bolivia between 1981 and 1986 due to severe disagreement on the management of the economy. After resumption of lending in 1986, there have been two import support programs aimed at providing urgently needed spare parts for the agriculture, energy and transport sectors; followed by the Export Corridors Project (Cr. 2012) approved in 1989 to assist in the upgrading of road and rail networks critical to facilitating exports.

3.08 The RIC-I (Reconstruction Import Credit 1703-B0) was approved in May 1986. The main objectives of this credit (US\$64.0 million) were: a) to support the economic stabilization and structural reform program begun in August 1985; b) to alleviate the economy's foreign exchange constraint by financing the importation of priority equipment, spare parts, and other inputs for key economic and infrastructure support sectors; and, c) to be a first step in the rehabilitation of major public enterprises that would play a central role in Bolivia's medium-term development. The project was basically completed and was closed in December 1990.

3.09 The RIC-II (Credit 1828-B0, US\$47.7 million) was approved in June 1987, nine months after the RIC-I began disbursing. Its main objectives were to continue supporting the government's reform program and to provide financing to help in restoring economic growth. Adopting the operational mechanism of RIC-I, the proceeds of the RIC-II were also used to finance imported priority equipment,

spare parts, and other inputs for the agriculture, energy, and transport sectors. Furthermore, the procurement agent system has been strongly supported by the credit. At present, the credit is well advanced and substantial progress has been achieved during FY92. The amount committed and disbursed represents about 90% of the credit amount, leaving a nonutilized balance of about US\$4 million.

3.10 A third operation was signed in December 1988 for an amount of US\$49.4 million equivalent in yen. This co-financing operation by the Overseas Economic Cooperation Fund of Japan (OECF) has basically the same objectives, conditionalities, and operating mechanisms as RIC-II, but is intended to finance only public-sector imports. It gives IDA responsibility for clearing all the contracts under OECF financing and for keeping OECF fully informed at each stage. Despite an agreement in August 1990 to streamline these arrangements, disbursements are still slow. The present disbursement level only amounts to about 60% of the credit and the additional amount committed is minimal. This will likely require at least a six-month extension of the closing date (March 31, 1993).

3.11 IDA's next project in the transport sector is the Export Corridors Project (2012-BO) approved in May 1989. The project consists of major components of a program that aims to promote Bolivia's exports and reduce the costs of its foreign trade by the following measures: (a) improving land transport corridors to the Atlantic and to the Pacific, (b) strengthening railway management, (c) improving road and rail maintenance, (d) strengthening the Ministry of Transportation and Communications in planning and policy making, and (e) facilitating trade by use of containers and airfreight. The credit amount is US\$37 million. An all-weather road linking La Paz to the Chilean border (Patacamaya and Tambo Quemado) to be financed by IDB and the Japanese Government completes the program. Credit 2012-BO was declared effective in February 1990. The expected closing date is June 1995.

3.12 The credit includes financing for the following road components: (a) deferred maintenance and overlay of the La Paz-Oruro highway and supervision of the same (about 230 km), (b) labor-intensive road maintenance and drainage improvements on some 30 sections of the main routes to Bolivia's international borders, to be undertaken by small contractors using labor-intensive methods, through the Emergency Social Fund and (c) technical assistance to implement throughout the country, the SAM and the SAE, which were not yet adequately calibrated to Bolivian performance levels and costs. Generally, these components are being executed on schedule, after some initial delays in the date for effectiveness due to government changes and delays in completion of legal conditions. The civil works on the La Paz-Oruro highway are contracted and progressing satisfactorily. It is expected that they will be completed by 1992; the labor-intensive road and railway maintenance through ESF has already been successfully completed and disbursed; and the technical assistance to implement the SAM and the SAE has been completed by January 1992.

3.13 Disbursement on most of the railway components did not begin until late 1991, because ENFE did not meet the conditions for disbursements until then, but new management and the Performance Contract, agreed with the Government in 1990, have engendered a more commercial attitude that is showing good results already. However ENFE has not yet complied with an additional condition for first

disbursement against works on the La Paz-Arica rail lane, requiring improved collaboration with the Chilean company. Meanwhile, the INPEX consultancy studies on the use of containers for freight transport and for promoting air transport for exports have been delayed because of problems arising from the agency's lack of experience with IDA-financed contracts.

IV. THE PROJECT

A. Justification

4.01 The characteristics of Bolivia, described in paras. 1.5 to 1.9, have made for low traffic volumes and unusually high costs of transport (about twice those in neighboring countries). A major effort has been made to complete the basic network, but improving maintenance continues to be a critical requirement (more than 85% of the network is in poor condition) to efficiently service growing traffic volumes. This priority will require the allocation of additional funds for road maintenance and for strengthening road organization and operations in the near future. IDA's strategy for Bolivia recognizes that the country requires an adequate transport infrastructure for promoting exports, expanding industrial development, and developing agriculture. Reduction in vehicle operating costs is also of a high priority because the high cost of transportation is one of the major impediments to rural development and thus to poverty alleviation. With the proposed Project, IDA can use the experience gained under the previous operations to assist the Government to catch up on the backlog of maintenance, forestall further deterioration of the road network and correct institutional weaknesses.

4.02 Under the Export Corridors Project (ECP), SNC agreed with IDA on a detailed maintenance program for 1990 and an outline program for 1991-93. SNC will prepare and submit to IDA, before October 31 of each fiscal year, a detailed maintenance program for the following fiscal year, consistent with the outline program for 1991-93 and satisfactory to the Association. The road maintenance level required by the ECP compelled the Government to keep increasing the budget for SNC's current expenditure from approximately US\$23 million in 1989 to US\$26 million (plus about US\$20 million in the investment program) in 1991. However, these amounts are not yet sufficient to achieve a satisfactory maintenance level, especially in the rural network. On the other hand, it is difficult to ask for a major budgetary effort from the Government when the country is still far from completing construction and rehabilitation of the road network. Therefore, additional financing is necessary, and the proposed Project will help the Government to achieve this financing, and provide technical support to ensure that the funds are well spent. If, as expected, the new credit becomes effective in 1992, the total maintenance and rehabilitation budget will be able to reach about US\$120 million in 1993, including about US\$35 million for periodic maintenance by contract, and similar amounts in the following year.

4.03 The Project will help to finance the maintenance budget with a increasing share from the beginning, a peak in 1993-1994 and a reduced share in 1995, so that the maintenance budget for 1996 would be totally financed by the Government (see para. 2.35). This will allow SNC to catch up on the large backlog of maintenance and to match maintenance budgets to real needs, optimizing investment decisions.

4.04 The program of periodic maintenance by contract included in the proposed Project corresponds to roads that will remain under SNC's administration after the possible decentralization and therefore, will not be affected by the decentralization. The rest of the network that is maintainable but not included in the periodic maintenance program by contract will be maintained under the maintenance program by force account. The roads that are not maintainable (more than 21,000 km) need major rehabilitation or reconstruction and this type of work is beyond the scope of the proposed Project. The maintenance program by force account includes only works to keep these roads passable. If during the period of the project decentralization is implemented and a period of adjustment is needed, IDA will have the right to suspend disbursements until it has reassessed the need for the affected components, and agreed with SNC on how to proceed.

4.05 The project was designed and prepared during implementation of the Export Corridors Project and is a logical follow-on. Negotiations were held in Washington in April 1992. The Bolivian delegation was headed by the Minister of Transport, Communications and Civil Aeronautics.

B. Objectives

4.06 The objectives of the proposed Project are as follows:

- (a) Improve road conditions in order to reduce vehicle operating costs, improve access to markets, and encourage trade development;
- (b) Improve the road maintenance budget process;
- (c) Improve road maintenance management, planning and operations;
- (d) Improve investment planning for roads;
- (e) Assure SNC's adequate maintenance funding;
- (f) Strengthen the domestic construction industry by having private contractors participate in road maintenance works; and
- (g) Transfer maintenance technology and organization to the local governments in the framework of the proposed decentralization.

C. Project Description

4.07 The Project incorporates part of the periodic maintenance by contract included in the Investment Plan 1992-1996 (para. 2.23) and the Road Maintenance Program by force account for 1992-95, based on the use of the SAM and the SAE (para. 2.30).

4.08 The periodic maintenance sub-projects also include routine maintenance activities. Routine maintenance will be mainly carried out by SNC. This distribution of maintenance activities will make it possible to compare, in terms of cost and quality, force account versus contracted maintenance, in order to determine the most convenient shares of private and public maintenance execution. The following are the main components of the Project.

(a) Periodic Maintenance by Contract

4.09 The four-year plan of periodic maintenance by contract was agreed with the Government during negotiations, and will be updated annually and presented by SNC to IDA for review by September 30 of each year. The staff of the Project Implementation Unit (UEP) in SNC is capable of updating the programs according to the agreed methodology. The subprojects included in the plan have been evaluated in the framework of a multiannual maintenance program based on a detailed inventory of road conditions prepared by SNC and its consultants. The evaluation includes those remaining sections of the paved roads not included in the reconstruction programs or already rehabilitated or reconstructed, and all the gravel roads with sufficiently high standards and traffic volume to warrant periodic maintenance.

- Civil Works

4.10 As a result, 781 km (50%) of the paved network (Tables 12.1 and 12.2) and 765 km (7%) of the gravel network (Table 13) have been included in the periodic maintenance program to be financed by the Project. Cumulative additions of other roads in excess of 5% of the agreed total (in km) will occur only with IDA's agreement. Out of the 781 km of paved road, 186 km have been selected for thin overlay (2 inches or 5 cm), 510 km for surface treatment and 85 km for sealing. The 765 km selected from the gravel network will be regravelled (4 inches or 10 cm). The works will include drainage, installation of road signs, other improvements and routine maintenance activities, to bring the roads up to a satisfactory condition. The average base cost per km ranges from US\$70,000 to US\$94,300 for overlay and improvement, from US\$35,000 to US\$120,000 for double surface treatment and improvement, from US\$16,600 to US\$34,800 for regravelling and improvement and from US\$17,000 to US\$18,800 for sealing and improvement. The unit costs, while high, are acceptable. The base cost for the periodic maintenance program for the paved network is US\$42.6 million. The base cost of the periodic maintenance program for the gravel network is US\$17.5 million.

- Engineering Design

4.11 The task of completing the final engineering design for the roads included in the four-year periodic road maintenance program by contract is beyond the capacity of SNC. Therefore, funds are included under the Project for contracting outside consultants to assist SNC in carrying out the engineering designs for roads included in the last two years of the program. As a part of the plan of action agreed during negotiations, these engineering designs will be completed by December 31, 1992. (Engineering designs for roads included in the first two years have been completed during project preparation). This will facilitate the project's timely execution. The total base cost for these designs is US\$0.2 million for the paved network and US\$0.2 million for the gravel network.

- Supervision of Civil Works

4.12 To provide quality control and ensure compliance with bid specifications, independent consultants funded by the Project will supervise the civil works on the periodic maintenance program by contract. It is estimated

that the supervision will cost about 6% of the total works to be contracted and should total US\$2.6 million for the paved network and US\$1.0 million for the gravel network.

(b) Maintenance by Force Account

4.13 During project preparation, the maintenance activities and the parameters of the SAM and the SAE were reviewed and updated and used to prepare the maintenance programs for 1992-95. Total requirements for labor, materials, and equipment were determined using performance standards for each activity, based on approved work methods. The base cost for the maintenance program by force account (routine, some periodic, and emergency) for the period covered under the Project (1992-95) is US\$131.5 million (Annex 3) or about US\$870 per km per year, counting the total network, or about US\$1,600, counting only the network that is properly maintainable (20,500 km). The required amounts are substantially above the amounts budgeted in recent years. With this program, those remaining sections of the paved network not included either in the maintenance program by contract nor in the SNC's reconstruction programs, and about 4,000 km (36%) of the gravel network and 900 km (3%) of the earth network will be resurfaced.

4.14 The 1992-95 maintenance programs by activity as specified in Tables 1-5, Annex 3, form an integral part of the Project and were agreed during negotiation. The Government agreed to provide the funds needed to implement these programs. Agreement was also reached that by September 30 of each year, SNC will present to IDA a satisfactory updating of the road maintenance budget for the next fiscal year, and by March 31 of each year report to IDA the actual budget, by category of expenditure, spent for maintenance in the preceding fiscal year.

(c) Bridge Maintenance and Repair

4.15 SNC's proposed bridge maintenance and repair program includes 77 bridges (Table 14) identified and surveyed by SNC's engineers responsible for bridge maintenance. The works required to preserve the integrity of these bridges comprise some minor structural repair and maintenance work, as well as protective and channeling work in the rivers crossed. Most of the bridges are located on the roads included in the periodic maintenance program by contract. The base cost for this component is US\$3.5 million. The agreed new organization structure of SNC (para 2.17) includes a bridge maintenance unit within the maintenance department and, as part of the agreed plan of action, SNC will complete engineering designs for bridges to be started in 1994 and 1995, by December 31, 1992. (Engineering designs for bridges to be started in 1992 and 1993 have been completed during project preparation).

(d) Work Compound and Workshop Construction

4.16 Adequate work compound workshops and warehouses are essential to maintaining a road network and an equipment fleet. Under Loan 1587-B0, the Bank financed technical assistance to reorganize existing work compounds and workshops. However, several existing work compounds and warehouses require

reconstruction to bring the existing facilities to an acceptable standard. Also, there is a need for construction of several small workshops to carry out minor repairs and preventive equipment maintenance. Details of the program are given in Annex 4, Table 5. The Project includes US\$3.5 million for this program to be carried out by local contractors.

(e) Equipment

4.17 Purchases of new equipment are not necessary to carry out the maintenance programs (1992-1995) by force account (para. 2.14), unless new units are justified by future adjustments of these programs. However, many units need to be rehabilitated before they can be put into service. A program of equipment rehabilitation and repair has been prepared by SNC using the SAE with the assistance of consultants (Annex 4, Table 3). This program includes the needs for equipment rehabilitation and major repairs during the period 1992-95 and comprises all units more than three years old in 1991. It is based on the needs in equipment availability to carry out the 1992-95 maintenance programs by force account. The total cost of the program is about US\$3.0 million. The equipment rehabilitation and repair will be carried out by contract. This contracting system will have the additional advantage of preventing the expansion of SNC staff. Minor repairs included in the equipment repair programs will be carried out by SNC's and local suppliers' workshops that have adequate facilities.

4.18 The following needs will be met by other types of equipment to be financed by the proposed Project:

- Adequate control of axle loads and maximum vehicle weights requires the acquisition of vehicle weighing scales and the rehabilitation of control stations, that can also be used to control vehicle emissions. The Project provides US\$1.0 million for these purposes. SNC will put into operation the axle weighing equipment, financed by this Project or other lenders and donors, by December 31, 1993, following the results of the study, financed by the Credit 2012-BO, completed in January 1992.
- Improving traffic data and strengthening works supervision require acquisition of traffic counters and laboratory equipment for the SNC soil laboratory (Annex 7). The Project includes US\$0.9 million for these purposes.

(f) Road Safety

4.19 The current signalling system is inadequate. Except on major traffic arteries, there are no road markings and vertical signalling is minimal. Safety barriers are almost nonexistent. A program for marking and signalling and for barriers has been prepared for the period 1992-96. The cost for the materials needed to carry out this program is US\$1.6 million (Annex 8). The Project provides funds for the acquisition of these materials, which will be installed by SNC personnel.

(g) Institutional Strengthening

4.20 This component is designed to improve maintenance management and administration in SNC, even in the case of a possible decentralization during the years of the Project. It aims to increase the level and quality of road maintenance, focusing SNC's activities on maintenance tasks through the following: (i) an action program to be agreed with SNC during negotiations; (ii) technical assistance; and, (iii) training.

(i) Action Program

4.21 During negotiations, agreement was reached on an action program (see para 5.23). It includes the following changes in SNC's organization: (i) creation of a maintenance branch in SNC, separate from the engineering and construction branches, assisted by the UEP and comprising the maintenance department, the equipment department and the districts; (ii) creation of a bridge maintenance unit within the maintenance department; (iii) strengthening of the equipment management unit, within the equipment department; and (iv) appointment of an engineer in charge of road maintenance in each of the SNC's ten districts.

(ii) Technical Assistance

- Implementation of the SAM and the SAE in the local Departmental Road Directorates (DDV).

4.22 The Project will provide technical assistance for strengthening the technical and administrative capacity of the proposed new DDVs, and their organization during and after the probable transfer of responsibility for road administration. This technical assistance will also include: (a) implementation of the SAM and the SAE in the new DDVs; (b) training for DDVs' staff in the use of the SAM and the SAE; (c) study of human, physical, and financial needs of SNC and the new DDVs; and (d) organization and use of these resources after the decentralization. Detailed terms of reference are included in Annex 9 (confirmed during negotiations). The Project provides US\$1.0 million for this assistance. If the decentralization is not carried out during the years of the Project, this technical assistance will not be implemented.

- Road Infrastructure Financing Study

4.23 The existing system of road financing is unsatisfactory. SNC acts only as an executing agency for road maintenance and construction. It has limited planning capability and financial responsibility. The existing system of road user charges is inefficient in raising revenue, and there is no direct link between the most important user charge, that derived from fuel taxes, and expenditure on road infrastructure. The technical assistance included in this Project will analyze the possible alternatives to ensure adequate maintenance funding when the Project is completed. The study will also provide for a review of the standards of road design, the costs of maintenance and construction, and the appropriate level and structure of road user charges. Detailed terms of reference are included in Annex 5 (confirmed during negotiations). The total cost of the technical assistance is estimated at US\$0.4 million. The study will be completed by December 31, 1993.

- Construction Industry Study

4.24 This study will analyze the existing capabilities and structure of the Bolivian construction industry to identify constraints on management, equipment, and finance. The analysis will assess the effectiveness of government incentives to strengthen the viability of local firms. The study will also review the existing levels of construction technology and ways to improve it. Other areas covered by the study will include: wage rates, employment regulation, import procedures and customs duties, taxation regime, and regulations affecting the construction industry. The study will be completed by December 31, 1993. Detailed terms of reference (confirmed during negotiations) are included in Annex 10. The cost for this study is estimated at US\$0.2 million.

- Project Executing Unit (UEP)

4.25 The UEP was created in SNC in 1989 to coordinate actions on projects with external financing. Nevertheless, it has focused on the implementation of the SAM and the SAE, using CAF's financing first and IDA's later on. In recent months the UEP has also coordinated the preparation of information for this Project. We consider this unit an important part of project implementation, especially as from the very beginning the chief of the unit has been assisted by a foreign consultant. This consultant now has a comprehensive knowledge, not only of the UEP and the Project components but of the SNC's policies and procedures as well. The Project provides financing to extend the contract of this consultant, or to contract another one, during the four years of the Project, at an estimated cost of US\$0.5 million.

(iii) Training

4.26 Training was to have been important in the development of the first Highway Maintenance Project (1587-BO), but only 7% of the planned effort was carried out, due to the political and economic crisis during the years of the project. However, training and equipment materials were purchased and one training center was established in Suticollo, near Cochabamba. Recently, SNC has rehabilitated this training center. With some additional purchases of equipment and training materials for this school, it will be possible to carry out a detailed training program, prepared by SNC (see Annex 11). This program (confirmed during negotiations) is mainly addressed to potential users of the SAM and the SAE and equipment operators. The Project includes financing for the training program, at a base cost of US\$0.3 million and an additional US\$0.2 million for training activities and scholarships for SNC's qualified staff.

(h) Procurement agencies' fees

4.27 By law, all public-sector procurement for amounts over 200,000 bolivianos (approximately US\$60,000) must be handled by international procurement agents. The Government so far has general agreements with two such agencies: the UN Office of Project Services, the Crown Agents (UK) and C3D (France). Each implementing agency may choose which to use. Provision for procurement services of these authorized procurement agents is estimated at an average of 2.8% of the costs of works and goods to be processed by them. The costs of these procurement services total US\$3.0 million.

D. Project Costs and Financing

4.28 The total cost of the four-year (1992-95) program, including provision for contingencies over the implementation period, is estimated at US\$240.0 million equivalent. Of this sum, US\$80.0 million, or 33.3 percent of the total project cost, would be financed by IDA. The remaining US\$160.0 million (an average of US\$ 40.0 million per year), or 66.7 percent of the total project cost, would be financed by the Government. The IDA Credit will finance the foreign exchange component for civil works and equipment and the technical assistance program. The table on the following page summarizes the components, the foreign and local base costs, the provisions for physical and price contingencies and the loan financing plan. The project cost by year is shown in Table 15, and by agency in Table 16. The costs reflect July 1991 prices.

4.29 Project cost estimates are based on: (a) final engineering for the first and the second years of the periodic road maintenance program and preliminary engineering for the third and fourth years; (b) preliminary cost estimates for bridge and workshop rehabilitation obtained from the up-dated costs of past works; (c) published suppliers' spare parts and other materials prices, adjusted for inflation; and (d) prevailing fees for individual technical assistance consultants (US\$12,000 per man-month for expatriate consultants and US\$6,500 for local). The costing was done in foreign currency equivalent, so the expected realignment of the exchange rate will not affect the total project cost in dollars.

4.30 Provision for physical contingencies has been adopted at a rate of 10% of the base price for periodic maintenance by contract, bridge maintenance and work compound and workshop construction. Physical contingencies are estimated at US\$7.1 million. Provision for foreign and local price escalation is based on IDA projections of price index variations for road-related manufactured goods imported to Bolivia. The rate used is 4 percent for the period 1992-96. Price contingencies total US\$20.4 million equivalent.

4.31 During negotiations the Government, to ensure timely implementation, agreed to earmark the counterpart funds for the Project for the next four years as follows: 1992 - US\$28.1 million; 1993 - US\$ 42.2 million; 1994 - US\$46.1 million; 1995 - US\$43.2 million and, 1996 - US\$0.4 million; (see Tables 15 and 16).

4.32 Furthermore, it is necessary to ensure that, starting in 1996, the maintenance budgets will be totally financed by the Government (see para. 4.03). For this purpose, an agreement will be reached by September 30, 1994, on the mechanisms the Government will use to finance road and bridge maintenance expenditure, routine and periodic for 1996 and thereafter (see para. 2.35).

E. Economic Evaluation

4.33 During project preparation, an economic analysis was made of all road subprojects included in the periodic maintenance component and all equipment rehabilitation included in the equipment component. These components account for 72% of the total project costs and 58% of the IDA financing. The average economic rate of return is 39% for the periodic maintenance component, with an average of 37% for the paved network and 45% for the gravel network, and 42% for

BOLIVIA									
SECOND ROAD MAINTENANCE PROJECT									
FINANCING OF PROJECT COSTS									
	Local Foreign Total			Local Foreign Total			Financing Plan		
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	---	---	---	---	---	---	---	---	
A.	Periodic maintenances: Paved Network								
a)	Overlay	10.6	43.7	54.3	2.8	11.5	14.3	2.8	11.5
b)	Surface treatment	20.1	81.7	101.8	5.3	21.5	26.8	5.3	21.5
c)	Sealing	1.1	4.6	5.7	0.3	1.2	1.5	0.3	1.2
d)	Engineering Studies	0.0	0.8	0.8	0.0	0.2	0.2	0.0	0.2
e)	Supervision	2.3	7.6	9.9	0.6	2.0	2.6	0.6	2.0
	Subtotal	34.2	138.3	172.5	9.0	36.4	45.4	9.0	36.4
B.	Periodic maintenances: Gravel network								
a)	Regravelling	13.3	53.2	66.5	3.5	14.0	17.5	3.5	14.0
d)	Engineering Studies	0.0	0.8	0.8	0.0	0.2	0.2	0.0	0.2
e)	Supervision	0.8	3.0	3.8	0.2	0.8	1.0	0.2	0.8
	Subtotal	14.1	55.5	71.1	3.7	15.0	18.7	3.7	15.0
C.	Maintenance by Force Account								
a)	Personnel	262.6	0.0	262.6	69.1	0.0	69.1	69.1	0.0
b)	Equipment operation	173.7	44.8	218.5	45.7	11.8	57.5	57.5	0.0
c)	Road materials	7.2	11.4	18.6	1.9	3.0	4.9	4.9	0.0
	Subtotal	443.5	56.2	499.7	116.7	14.8	131.5	131.5	0.0
D.	Bridge maintenance								
		2.7	10.6	13.3	0.7	2.8	3.5	0.7	2.8
E.	Work Compound Construction								
		3.8	9.5	13.3	1.0	2.5	3.5	1.0	2.5
F.	Equipment								
a)	Rehabilitation	3.4	8.0	11.4	0.9	2.1	3.0	0.9	2.1
b)	Scales & control stations	1.1	2.7	3.8	0.3	0.7	1.0	0.3	0.7
c)	Counters and Lab. Equip.	1.1	2.3	3.4	0.3	0.6	0.9	0.3	0.6
	Subtotal	5.7	12.9	18.6	1.5	3.4	4.9	1.5	3.4
G.	Road Safety Program								
		1.9	4.2	6.1	0.5	1.1	1.6	0.5	1.1
H.	Institutional Strengthening								
a)	Implement. of SAM & SAE	0.0	3.8	3.8	0.0	1.0	1.0	0.0	1.0
b)	Road Infra. Financing	0.0	1.5	1.5	0.0	0.4	0.4	0.0	0.4
c)	Const. Industry Study	0.0	0.8	0.8	0.0	0.2	0.2	0.0	0.2
d)	Project Coordination	0.0	1.9	1.9	0.0	0.5	0.5	0.0	0.5
e)	Training Courses	0.0	1.1	1.1	0.0	0.3	0.3	0.0	0.3
f)	Training Activities	0.0	0.8	0.8	0.0	0.2	0.2	0.0	0.2
	Subtotal	0.0	9.9	9.9	0.0	2.6	2.6	0.0	2.6
I.	Procurement services								
		0.0	11.4	11.4	0.0	3.0	3.0	0.0	3.0
	BASE COST	505.8	308.6	815.9	133.1	81.6	214.7	147.9	66.8
	Physical contingencies	6.8	19.8	26.6	1.8	5.2	7.0	2.5	4.5
	Price contingencies	38.4	31.2	69.5	10.1	8.2	18.3	9.6	8.7
	TOTAL COST	551.0	359.5	912.0	145.0	95.0	240.0	160.0	80.0

the equipment component . The following Table provides a summary of the results. Further details are provided in Annex 12.

	Component Cost US\$ million	ERR
Periodic Maintenance		
- Paved Network	42.6	37%
- Gravel Network	17.5	45%
Subtotal Periodic Maintenance	60.1	39%
Equipment Rehabilitation	3.0	42%

4.34 The economic analysis of the periodic maintenance component was carried out using the HDM III model. The following options were examined by the model on 838 km of the paved network: (a) routine maintenance; (b) sealing of 10 mm (only for roads with asphalt concrete); (c) double surface treatment of 20 mm; and, (d) asphalt concrete overlay of 50 mm. Four components of postproject routine maintenance were considered for each section of paved road evaluated as follows: a) patching, (b) resealing, (c) patching and resealing, and (iv) routine maintenance. A separate analysis was conducted for 893 km of the gravel roads. The evaluated project was similar in all cases and included provision of a new surface of 150 mm of gravel, with associated complementary works such as construction of retaining walls, provision of drainage, and so forth. Four components of postproject routine maintenance were considered for each section of road evaluated: (a) replacement of between 5 and 50 m³/km/year of gravel; (b) grading at intervals determined by the volume of traffic, from once every fifteen to ninety days; (c) replacement of the surface with 100/150 mm of new gravel at intervals also determined by the volume of traffic; and, (d) routine maintenance.

4.35 The analysis resulted in the following recommendations: for the 1,731 km of road analyzed, 185 km merit only routine maintenance because of low actual and projected traffic; these sections of road were therefore excluded from the periodic maintenance program. Of the remaining 1,546 km included in the program, 186 km justify overlay, 510 km justify surface treatment, 86 km justify sealing and 765 km of gravel roads merit regravelling.

4.36 Three sensitivity analyses were carried out on the economic evaluation of each subproject. The first considered a 25% increment in construction and maintenance costs, but with the benefits constant. The second considered a 30% reduction in benefits, while the third assumed that the value of car and passenger time savings was zero. Almost all tests produced acceptable rates of return (greater than 12%) for all subprojects. Two exceptions were subprojects in the gravel network (in the district of Santa Cruz) with a cost of less than US\$0.6 million and a combined road length of 23 km. There are reasons to believe that the economic rate of return on both links is underestimated because of the conservative assumptions of traffic growth. Both links are expected to have higher than average traffic growth rates because they provide links to committed new industrial developments. They have therefore been retained in the program. The estimated cost and economic rate of return for each road link are shown in Annex 12.

4.37 The basic rates of return vary from 16% to more than 100%. Economic rates of return are sensitive to the investment cost of subprojects. This being so, agreement should be reached during negotiations that IDA will be consulted before implementation of any subproject where final engineering costs exceed the original estimate by more than 25% in dollar terms.

4.38 Furthermore, the Bank's HDM model was used to analyze different quantity standards for routine maintenance and select the optimum alternative for a specific road condition. The levels of maintenance were so optimized and used in the SAM to obtain the maintenance program and budget. Another model, the Expenditure Budgeting Model (EBM) was then used, interacting with the HDM model, to select the maintenance policies and maximize the investment under the budget restrictions. These new quantity standards were then used in the SAM to determine another maintenance program, adjusted to the resources available.

V. PROJECT IMPLEMENTATION

A. Project Execution

(a) General

5.01 Implementation of the Project will take about four years from the third quarter of 1992 through the second quarter of 1996 (Chart V). This is the time necessary to carry out the plans for road and bridge maintenance, work compound construction, equipment rehabilitation and technical assistance.

5.02 SNC will have overall responsibility for the Project. The new organization structure of SNC, agreed during negotiations, includes a new maintenance branch (para. 2.17), separate from engineering and construction, to improve the efficiency of road maintenance. The maintenance branch comprises the maintenance department, the equipment department, the new bridge maintenance unit (para. 4.15) and the ten districts. This new organization will be implemented before credit effectiveness. In this way, SNC will be enabled to focus more on maintenance tasks, thus increasing the probability that the Project will succeed in permanently increasing the level and quality of road maintenance. As part of this restructuring, SNC will appoint an engineer in charge of road maintenance in each of its ten districts. With these changes, SNC will be capable of carrying out the Project. Furthermore, local and foreign contractors working in the country have already satisfactorily carried out programs at or about the scale foreseen under the Project.

5.03 The maintenance branch and the future DDVs will be the beneficiaries of the credit. The labor-intensive road maintenance and rehabilitation funded by ESF saw the emergence of many small contractors. This valuable experience will be taken into account. General administrative coordination and relations with IDA will be supported by the project executing unit (UEP) in SNC, which was established under previous credits. The UEP, now within the maintenance department, will be transferred to the new maintenance branch. This will extend the present role of the UEP to the equipment department and the districts. The UEP will be assisted by an expert financed under the Project.

(i) Periodic and Routine Maintenance

5.04 Overall responsibility for carrying out the road maintenance component will be vested in the maintenance branch. It will carry out most of the routine and emergency maintenance as well as some periodic maintenance. All other road maintenance will be carried out by contract. Preparation of final engineering and bidding documents and final cost estimates for civil works of roads scheduled to be contracted in the first two years of the Project have been completed by SNC with the assistance of consultants.

5.05 Civil works contracts will be packaged to comprise about 50-150 km of road works grouped, wherever possible, by geographical location and type of work. This would facilitate contractors' logistic activities, speed up the work, and attract more foreign contractors to compete. A list of tentative packages, agreed during negotiations, is provided in Table 17.

5.06 To ensure adequate quality, all civil works to be contracted will be supervised by engineering consultants funded under the Project. They will ensure compliance with design specifications and report any delay in execution as well as propose on-site solutions in case of unforeseen difficulties. They will also submit to SNC quarterly progress reports.

(ii) Other Components

5.07 Maintenance and rehabilitation of bridges will be carried out by contract and supervised by the new bridge maintenance unit (paras. 4.15 and 5.02). Work compound and warehouse construction and rehabilitation will also be carried out by contract and supervised by the construction units in the districts. Rehabilitation of all equipment will be done by private suppliers' workshops under control of the supervision division in the equipment department. This same division will control the acquisition of spare parts and material for equipment operation. Acquisition of traffic counters will be controlled by the maintenance department, acquisition of laboratory equipment by the geology and geotechnic division, and acquisition of asphaltic materials by the maintenance department. Equipment for the axle-weight study and traffic counters will be installed under the supervision of the maintenance department.

(iii) Technical Assistance and Training Programs

5.08 The responsibility for the various technical assistance and training assignments will be as follows: (a) implementation of SAM and SAE in DDV's - maintenance branch, (b) road infrastructure financing - planning and road policy department, (c) construction industry study -, planning and road policy department; and (d) technical assistance to project executing unit - UEP.

B. Procurement

5.09 Procurement will be carried out in accordance with the Bank's "Guidelines for Procurement under IBRD Loans and IDA Credits, May 1985". The selection and appointment of consultants for studies and technical assistance will be consistent with the August 1981 "Guidelines: Use of Consultants by World Bank Borrowers and by the World Bank as Executing Agency." During negotiations, standard bidding documents for the procurement of goods and works, which will be printed, a standard letter of invitation and a model form of contract for the

employment of consultants, were agreed upon. They will then be used for all procurement financed under the proposed credit.

5.10 Works. The civil works components include contracts for US\$84.4 million. Civil works contracts for periodic road maintenance are estimated to cost US\$75.6 million. Bridge maintenance and repair is estimated to cost US\$4.4 million. Workcompound construction is estimated to cost US\$4.4 million. Contracts for periodic road maintenance valued at US\$2.0 million each or above (US\$52.7 million), will be awarded through international competitive bidding (ICB) and when valued below the US\$2.0 million limit, if not in excess of US\$22.9 million equivalent in aggregate, will be awarded through local competitive bidding (LCB) procedures acceptable to IDA. LCB procedures will also be used for bridge maintenance and repair and construction of workcompounds totaling US\$8.8 million, since these will have a small cost (no more than US\$300,000 each) and be geographically scattered. Rehabilitation and major repairs of road maintenance equipment may need to be carried out at specialized workshops abroad, to whom complete machines or assemblies (engines, transmissions, etc.) would be sent. Thus, in order to save on freight costs, these overhauls would be contracted, up to an aggregate of US\$3.0 million, through limited international bidding (LIB) based on lists of prospective contractors from convenient locations and ensuring adequate competition. Minor repairs of equipment valued at below US\$25,000 and not exceeding US\$0.5 million in aggregate, will be contracted locally, on the basis of price quotations requested from at least three qualified workshops.

5.11 Equipment, Materials and Goods. Traffic counters, weight scales and laboratory equipment totalling US\$2.1 million and road safety materials (US\$1.8 million), will be grouped in packages valued at above US\$100,000 and procured through ICB. However, small groups of items costing less than US\$25,000 and not exceeding US\$0.5 million in aggregate, may be procured on the basis of price quotations obtained from at least three suppliers. For the purpose of comparing foreign and local bids for goods under ICB, domestic manufacturers may be allowed a margin of preference in accordance with Bank's guidelines. A summary of procurement arrangements is presented in the Table below. Due to the complexity of the data, the project implementation schedule cannot be presented in a single table. The information is included in Tables 12, 13, 14 (i and ii), Tables in Annex 3 and 4, and Chart V.

5.12 IDA will review ex-ante all procurement documentation under ICB and LIB procedures as well as LCB documents for work contracts estimated to cost above US\$500,000 equivalent. LCB documents for work contracts valued at between US\$250,000 and US\$500,000 equivalent will be subject to ex-post-review by IDA. All other procurement documentation will be retained by SNC and subject to selective ex-post review by IDA. Under these procedures IDA's prior review will cover about 70% of total contract values.

Summary of Procurement Arrangements (US\$ million equivalent) a/					
Project Component	ICE	LCB	Other	NIF	Total
Works					
Periodic Maintenance (Paved Network)	43.3 (34.8)	10.2 (8.2)	(-)	(-)	53.5 (43.0)
Periodic Maintenance (Gravel Network)	9.4 (7.7)	12.7 (10.1)	(-)	(-)	22.1 (17.8)
Bridge Maintenance and Repair	(-)	4.4 (3.6)	(-)	(-)	4.4 (3.6)
Work Compound Construction	(-)	4.4 (3.2)	(-)	(-)	4.4 (3.2)
Equipment Rehabilitation	3.0 e/ (2.1)	(-)	0.5 (0.4) b/	(-)	3.5 (2.5)
Equipment Materials and Goods					
Spare Parts	(-)	(-)	(-)	65.5 (-)	65.5 (-)
Other Equipment (Traff. count, Lab, scales)	2.1 (1.5)	(-)	(-)	(-)	2.1 (1.5)
Asphaltic Materials for Road Maint. by SNC	(-)	(-)	(-)	5.6 (-)	5.6 (-)
Road Safety Materials	1.3 (1.0)	(-)	0.5 b/ (0.4)	(-)	1.8 (1.4)
Consultants					
Engineering and Supervision	(-)	(-)	3.0 c/ (4.0)	(-)	3.0 (4.0)
Institutional Strengthening	(-)	(-)	3.0 d/ (3.0)	(-)	3.0 (3.0)
Recurrent Expenditures	(-)	(-)	(-)	69.1 (-)	69.1 (-)
TOTAL COST INCLUDING CONTINGENCIES	59.1 (47.1)	31.7 (25.1)	3.0 (7.8)	140.2 (-)	240.0 (80.0)
NIF - Not IDA Financed (Components financed only by the Government)					
a/ Figures in parenthesis are the amounts financed by IDA.					
b/ Shopping					
c/ Consulting services					
d/ Consulting services, training, tuition and fellowships					
e/ Limited International Bidding (LIB)					

C. Disbursements and Special Account

5.13 Disbursements will be made on the following basis:

- 80% of total expenditure on civil works from the periodic maintenance by contract program in the paved and gravel networks, and engineering and supervision of the same, and for the bridge maintenance and repair program.
- 70% of total expenditure for work compound and equipment rehabilitation.
- 100% of foreign expenditure for equipment and road safety materials.
- 100% of expenditure for technical assistance by consultants.

The allocation of credit proceeds for the various categories is shown in Table 18.

5.14 Retroactive financing is recommended for payments made under the Project after January 1, 1992, but before the date of signing of the Credit, up to a total of US\$8.0 million to finance the program of maintenance for 1992 and technical assistance to the UEP.

5.15 A special account will be established in the Central Bank with an initial deposit of US\$4.0 million (this figure represents approximately four months of expected IDA disbursements). SNC would be entitled to make payments from the special account for the IDA-financed portion of all expenditure. Applications for replenishment of the special account would be submitted using statements of expenditures (SOEs) for expenditures under contracts for: (a) civil works whose value is the equivalent of US\$500,000 or less; (b) equipment and road safety materials costing the equivalent of US\$25,000 or less; and (c) consultant services and training costing the equivalent of US\$20,000 or less. At negotiations, agreement will be reached with the Government on the terms and conditions for the special account, including the implementation of internal controls for the management of the account.

5.16 The estimated disbursement schedule for the proposed credit, based on the assumption that the credit would become effective by October 1992, is shown in Table 19. The estimated profile extends disbursements through mid-1997, almost five years, which approximately coincides with the standard profile for Bolivia. By comparison, the road component of the Export Corridors Project (about US\$20 million) will take about three years to disburse. To allow for possible slippage, the closing date would be June 30, 1998.

D. Audits

5.17 Under the Export Corridors Project (2012-BO) it was agreed that the implementing agencies would be required to appoint private independent commercial auditors to avoid the delays in submitting audit reports to the Association under previous projects. This agreement has been extended to this Project. All records relating to project expenditures will be kept by the UEP within SNC. During negotiations, agreement was reached that SNC will contract private external auditors acceptable to the Association, to audit project expenditures, Special Account, Project Account and Statements of Expenditures, in accordance with generally accepted auditing standards. The audit report will be submitted no later than four months after the end of each fiscal year.

E. Environmental Impact

5.18 So far, SNC's capacity to analyze the environmental impact of road projects is very limited. Its planning department reviews environmental issues in particular projects on an ad-hoc basis, but it has no staff permanently assigned to the task. It also does not have up-to-date environmental guidelines to be used by contractors. In the past, SNC has turned to outside consultants for a study whenever a major issue arose. While outside help is a viable strategy to deal with major studies, SNC's capability needs to be strengthened. The Environmental Technical Assistance Project, currently under preparation, aims to address the environmental institutional strengthening needs of the central environmental authorities, and of sectoral executing agencies like SNC. For this Project (but mainly for future SNC projects probably involving new construction or major upgrading in environmentally sensitive areas), it is important to institutionalize an environmental assessment and management capability within SNC. Therefore, as a condition for negotiations, SNC established an environmental unit (EU) within the planning department with an environmental specialist and support staff. The unit will be provided with sufficient resources to carry out its task. The EU will be responsible for issuing an environmental assessment (including initial project screening and terms of reference for environmental impact studies). The final environmental declaration

for all projects will be the responsibility of the newly established Environmental Protection Agency, before the signing of each civil works contract. This will disclose any environmental issues, and describe mitigatory measures needed to address it. The EU will also prepare environmental guidelines to be used by contractors and supervise the work of consultants when a full impact assessment study is required. In particular, the EU will do the following:

- (a) Prepare a plan for measures to mitigate the direct and indirect effects of the road.
- (b) Examine the design and the contracts of road construction and maintenance to verify that environmental aspects have been considered, and to prevent or mitigate the possible negative effects.
- (c) Help to educate personnel in the construction area of SNC on the measures that should be taken to avoid or mitigate negative effects of construction on environmental, cultural, and archeological resources.
- (d) Follow the construction process of the works, advising the SNC on problems and suggesting corrective measures.
- (e) Help to select forest guardmen for the protection of special areas and protected species, and help to train them so that they fulfill their responsibility of protection agents.
- (f) Train the staff of the SNC on environmental, cultural and archeological matters.
- (g) Liaise with the Ministry of Education on matters related to cultural protection of the projects.
- (h) Collaborate with other government agencies responsible for the renewable natural resources and environmental protection, in preparing guidelines for evaluation studies of environmental programs for transport, emphasizing road construction and maintenance.
- (i) Aid in identifying and contracting additional consultants needed to execute environmental protection programs included in road construction and maintenance plans.
- (j) Participate in the preparation of all annual and quarterly reports on implementing measures included in the environmental protection programs.
- (k) Identify and organize the collection and analysis of the information needed to prepare ex-post studies on environmental effects, including the methodology to be used.

5.19 Since the civil works under the Project involve only maintenance (routine and periodic) of the existing infrastructure with no new road construction or major upgrading, they will not adversely affect the quality of environmental or ecological systems. Only minor environmental effects would result directly from

the road maintenance works themselves, which include quarrying, borrow pits, and disposal of road materials and wastes. A study of such possible effects on the environment was carried out by SNC with the assistance of a specialist financed by Credit 2012-BO. The study recognizes that the maintenance programs financed by the Project will have a positive effect for the environment, and will help to eliminate or reduce negative effects produced by road construction and/or lack of adequate road maintenance (namely reduction of road-related erosion and improvement of stream drainage at road crossings). The results of the study also include the measures to be taken to relieve those possible effects on the environment. These measures have been considered by SNC as specifications for the maintenance works and incorporated as safeguards into the bidding documents for all the civil works financed by the Project and into the SNC code of maintenance. The summary, conclusions, recommendations and main specifications for contractors and SNC resulting from the study are included in Annex 13.

F. Monitoring and Reporting

5.20 During negotiations, agreement was reached on annual project reviews with the participation of the Government, SNC and IDA, which will cover the following topics:

- SNC's new organization performance
- Investment Plan (including coordination of sources of funds)
- Program of periodic maintenance by contract (1992-1995)
- Program of maintenance by force account (1992-1995) and actual expenditure
- Retail prices of transport fuels
- Maintenance financing
- Road decentralization
- Program of institutional strengthening
- Environmental mitigation measures
- Audit reports

5.21 A mid-term project review will be carried out in 1994 and will include an assessment of SNC's maintenance planning and budget allocations and the correspondence between budget allocations for maintenance and actual and timely release of funds by the Treasury. The review will also include agreement on the mechanisms for financing road and bridge maintenance, starting in 1996, based on the assessment above and the recommendations of the Road Maintenance Financing Study (paras. 2.35 and 4.23). The supervision of project implementation will be carried out according to the Supervision Plan in Annex 14.

5.22 The four-year plan of periodic maintenance by contract will be updated annually and presented by SNC to IDA for review by September 30 of each year. SNC will also present to IDA a satisfactory updating of the road maintenance budget for the next fiscal year, and by March 31 of each year report to IDA the actual budget, by category of expenditure, spent for maintenance in the preceding fiscal year. Physical progress on the maintenance programs, data on quality control and the parameters in the SAM and the SAE (annual work quantities, performance standards etc.) included in the tables of Annex 3 and 4 will be used as performance indicators to monitor the Project.

5.23 In addition, agreement was also reached during negotiations on an action program including the following:

Date	Action
Credit Effectiveness	<ul style="list-style-type: none"> - Put into effect the agreed new maintenance organization (para. 2.17) - Put into effect the bidding documents agreed during negotiations
Dec. 31, 1992	Complete engineering designs for civil works to be started in 1994 and 1995 (paras. 4.11 and 4.15)
Dec. 31, 1993	<ul style="list-style-type: none"> - Put into operation the axle weighing equipment (para. 4.18). - Complete the road financing study (para 4.23) and the road construction industry study (para. 4.24).
Sep. 30, 1994	<ul style="list-style-type: none"> - Assess SNC's maintenance planning and budget allocations. - Agree on the mechanisms for financing maintenance for 1996 and thereafter (paras. 2.35 and 5.20).

5.24 SNC will submit quarterly reports to IDA containing; (i) an updated list of eligible subprojects of periodic road maintenance by contract; (ii) progress in implementation of all civil work contracts and other project components including the latest cost estimates; (iii) the status of credit disbursements against forecast; (iv) the amount of counterpart funds allocated to the Project in the fiscal year and the amount actually spent; (v) the actual road maintenance budget for the preceding year, the budget allocated for the current year, and physical progress plan for the year; and (vi) the effects of the Project on the environment during the period reported. Finally, SNC will submit to IDA a project completion report by December 31, 1998, or 6 months after the credit is closed whichever is earlier.

G. Project Benefits

5.25 The Project will contribute to a substantial upgrading of about 33% of the maintainable network, with 100% of the entire paved network and 70% of the gravel network in good or fair condition by 1996, substantially reducing the large backlog of maintenance. The Project will also improve maintenance planning and organization and budgetary control. Other project benefits include higher availability of road equipment, reduction in maintenance costs, and introduction of effective and systematic maintenance practices, including the use of contractors for maintenance. As a consequence, this will substantially reduce vehicle operating costs. The average rate of economic return is expected to be 39% (see para. 4.34).

H. Project Risks

5.26 This is the third IDA/IBRD-financed road project in Bolivia and it has been prepared on the basis of experience gained in the previous projects. In the past, one major obstacle to bringing the road network to acceptable standards was weak maintenance management. Under the Export Corridors Project, comprehensive management systems were completely implemented by January 1992, and now are available to SNC's staff, which will help overcome one of the major past risks. Another risk in the past, the possibility of delay in starting civil works because of insufficient engineering design capability, will also be avoided by having completed designs before appraisal for the first two years and by including funds in the Project for technical assistance for engineering designs for the two last years.

5.27 The main remaining risk is delay in implementation for lack of counterpart funds. To minimize this risk, an agreement has been reached with the Government to allocate in its recurrent budget the necessary counterpart funds for the Project. Another potential risk is some institutional weakness, especially if decentralization is carried out. Experience in other countries of the region indicates that it is relatively easy to decentralize the remittance of funds but difficult to decentralize administrative procedures and controls. This is mainly because of the lack of sufficient qualified staff at the departmental level. Strengthening the maintenance department of SNC, especially UEP and the possible decentralized agencies, the designed supervision strategy (Annex 14), and extensive training programs will help to limit these risks. In addition, the planned implementation of the maintenance and equipment management systems in the future DDVs, the study of personnel and physical and financial needs for SNC and the DDVs, and the organization and use of these resources after the decentralization will further mitigate this risk. Taken together with the training of SNC staff in the use of the SAM and the SAE of equipment operators, and the technical assistance to the UEP, these measures adequately address the institutional risk.

VI. AGREEMENTS REACHED AND RECOMMENDATIONS

6.01 Agreement was reached during negotiations on the following:

- (a) SNC will establish a new structure (para. 2.17) which will include the following changes: (i) a planning unit capable of undertaking prefeasibility studies and updating the Investment Plan will be established in the planning department (para 2.21); (ii) a new maintenance branch will be created, separate from the engineering and construction areas (paras. 2.17, 4.21 and 5.02); (iii) the new maintenance area will be assisted by the UEP and will include the present maintenance department, the equipment department and the districts (paras. 4.21, 5.02 and 5.03); (iv) a new bridge maintenance unit will be created within the maintenance department (paras. 4.15, 4.21 and 5.07); (v) the maintenance management unit within the equipment department will be strengthened (paras. 2.15, 4.17 and 4.21); (vi) an engineer in charge of road maintenance to be appointed in each of the SNC's ten districts (paras. 4.21 and 5.02); and, (vii) the new environmental unit created in the planning department will be provided with sufficient resources to carry out its tasks (para. 5.18).
- (b) The 1992-1996 Road Investment Plan of SNC was reviewed, found generally satisfactory and agreed. SNC will give evidence to IDA before introducing any new major investment into the program that such investment is economically justified and will not exceed the financial and managerial capacity of the Government. The capacity is taken to be that indicated in the agreed Plan, so any change, which will require an increase in treasury funding in any year of more than 10% above that in the agreed Plan, will need to be agreed with IDA. The Plan will be annually reviewed by IDA, in light of the results of the economic evaluation studies to be undertaken by SNC (para. 2.26). The review will include an assessment of the success in co-ordinating the various sources of finance for the Plan (para. 2.26).

- (c) Retail prices of transport fuels will be maintained, throughout the period of the credit, at least at their current margin above opportunity cost, which includes the sum of border price, distribution costs and dealers' margins (para. 2.37). An attachment establishing the basis to monitor the fuel prices was also agreed;
- (d) IDA approval of annual work program and approval of new contracts will be contingent upon Government meeting the following agreed recurrent budget allocation: (paras. 2.40 and 4.31)

1992 - US\$28.1 million
1993 - US\$42.2 million
1994 - US\$46.1 million
1995 - US\$43.2 million
1996 - US\$0.4 million

These amounts will be revised and agreed upon during the annual progress reviews, depending on project implementation.

- (e) If during the period of the project decentralization is implemented and a period of adjustment is needed, IDA will have the right to suspend disbursements until it has reassessed the need for the affected components, and agreed with SNC on how to proceed (para. 4.04);
- (f) SNC will carry out periodic maintenance by contract according to the list of roads agreed with IDA and included in the document "Programa de Mantenimiento de Carreteras por Contrato 1992-95," that will be updated annually and presented to IDA by September 30 of each year (para. 4.09);
- (g) Cumulative additions to the periodic maintenance by contract plan of other roads in excess of 5% of the agreed total (in km) will be done only after obtaining IDA's agreement (para. 4.10);
- (h) The Government will cause SNC to implement the 1992-95 maintenance program by force account, as detailed in the document entitled "Programa de Mantenimiento por Gestión Directa, 1992-95" and allocate the funds necessary to implement this program (para. 4.14);
- (i) SNC will present to IDA, by September 30 of each year, a satisfactory updating of the road maintenance budget for the next fiscal year and, by March 31 of each year, will report to IDA the actual budget, by category of expenditure, spent for maintenance in the preceding fiscal year (para. 4.14). To facilitate monitoring on the funds used in maintenance, SNC will modify the structure of its current budget, in coordination with the Ministry of Finance (para. 2.30);
- (j) SNC will consult with IDA before contracting any work under the Project if final engineering estimates exceed the original cost estimate by more than 25% in US dollar terms (para. 4.38);

- (k) Road civil works will be grouped in packages according to the geographical location and type of work (para. 5.05).
- (l) The revised standard bidding documents, agreed during negotiations, will be printed and used for procurement of works and goods under the Project (para. 5.09);
- (m) SNC will contract private external auditors, acceptable to IDA, to audit project expenditure, special account, project account and statements of expenditures in accordance with generally accepted auditing standards. SNC will keep all records relating to project expenditure within the institution (para 5.17);
- (n) SNC will play an expanded monitoring and reporting role in project supervision, according to a supervision strategy to be detailed after the signature of the Credit (para. 5.21); and
- (o) SNC will submit quarterly reports to IDA showing: (i) an updated list of eligible subprojects of periodic road maintenance by contract; (ii) progress in implementation of all civil works contracts and other project components including the latest cost estimates; (iii) the status of credit disbursements against forecast; (iv) the amount of counterpart funds allocated to the Project in the fiscal year and the amount actually spent; (v) the actual road maintenance budget for the preceding year, the budget allocated for the current year, and physical progress of the maintenance plan for the year; and (vi) the effects of the Project on the environment during the period reported (para. 5.24).

6.02 During negotiations, agreement was also reached that annual project reviews will be held with the participation of SNC, the Government, and IDA. The annual reviews will cover the following (para. 5.20):

- SNC's new organization performance
- Investment Plan (including coordination of sources of funds)
- Retail prices of transport fuels
- Program of periodic maintenance by contract (1992-1995)
- Program of maintenance by force account (1992-1995) and actual expenditure.
- Road decentralization
- Maintenance financing
- Program of institutional strengthening
- Environmental mitigation measures
- Audit reports

A mid-term project review will be carried out in 1994 and will include an assessment of SNC's maintenance planning and budget allocations and the correspondence between budget allocations and actual and timely release of funds by the Treasury. Taking into account the results of the assessment and the recommendations of the Road Maintenance Financing Study, an agreement will be reached on the mechanisms for financing road and bridge maintenance for 1996 and thereafter (paras. 2.35, 2.40, 4.23 and 5.21).

6.03 Finally, during negotiations, an action program was agreed with SNC to expedite project execution and expand maintenance capacity. The action program (para. 5.22) will include the following:

- (a) Completion of engineering designs for the civil works of roads and bridges to be started in 1994 and 1995, by December 31, 1992 (paras. 4.11 and 4.15).
- (b) Purchase of portable scales for vehicle weight control are to be placed in operation by December 31, 1993 (para. 4.18).
- (c) Completion of the Road Infrastructure Financing Study and the Road Construction Industry Study by December 31, 1993 (para. 4.23).
- (d) Agreement on the mechanisms for financing road and bridge maintenance starting in 1996 by September 30, 1994 (paras. 2.35, 2.40, and 4.32).

6.04 As conditions for credit effectiveness, SNC will have:

- (a) Implemented the changes in its organization detailed in para. 6.01(a); and
- (b) Put into effect the bidding documents agreed during negotiations (paras. 6.01(1)).
- (c) Signed the Subsidiary Loan Agreement with the Government.

6.05 On this basis, the project would comprise a suitable basis for a development credit of SDR 58.6 million, equivalent to US\$80.0 million to Bolivia, on standard terms with a 40-year maturity.

BOLIVIA

Table 1

SECOND ROAD MAINTENANCE PROJECT

PUBLIC SECTOR TRANSPORT INVESTMENT (US\$ million)

Sector	1987 Prog.	1987 Actual	1988 Prog.	1988 Actual	1989 Prog.	1989 Actual	1990 Prog.	1990 Actual
Transportation	177.5	86.0	105.9	123.8	133.2	118.0	128.9	81.7
Agriculture	64.9	23.7	20.9	51.9	42.3	36.7	44.0	34.6
Mining	16.5	4.0	15.5	13.0	32.7	12.3	19.0	1.5
Hydrocarbons	151.0	87.9	141.2	92.3	185.5	92.9	156.4	105.4
Industry	13.4	2.2	0.3	2.7	1.6	1.3	2.0	0.5
Power	15.2	21.4	45.7	22.6	44.0	22.4	27.6	19.7
Communication	34.6	-14.6	13.5	11.5	24.8	5.6	28.4	21.2
Health	11.5	7.4	9.4	7.5	7.8	8.9	16.7	19.6
Education	16.3	8.7	4.7	7.0	10.0	9.8	15.1	14.4
Sanitation	40.3	16.9	28.6	30.0	37.7	30.5	35.6	29.3
Housing	43.7	24.3	44.4	37.0	24.5	22.2	20.1	16.9
Water	4.4	0.6	2.9	2.5	6.0	1.6	3.0	2.2
Multisector	16.8	7.5	7.7	16.2	22.5	14.3	16.3	12.7
Other	3.7	0.3	5.9	0.8	0.2	0.7	0.8	0.8
Total Investment	609.8	305.5	446.6	418.8	572.8	377.2	514.9	360.5
Actual/Prog.		50%		94%		66%		70%
Transport Investment	29%	28%	24%	30%	23%	31%	25%	23%
Actual/Prog.		48%		117%		89%		63%
Annual Growth - Total			-27%	37%	28%	-10%	-10%	-4%
Annual Growth - Transport			-40%	44%	26%	-5%	-3%	-31%

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Table 2

NATIONAL ROAD NETWORK
LINKS WITH AADT GREATER THAN 1,000 VEHICLES PER DAY

Ruta	Link No.	Origin	Destination	Length Kms	TMDA (1989)
2	1	El Alto	La Paz	12	28,537
4	2	Quillacollo	Cochabamba	13	6,619
9	3	Warnes	Santa Cruz	33	4,490
Sub total				58	9,942
9	4	Guabira	Montero	3	2,966
4	5	Vinto	Quillacollo	4	2,917
9	6	Montero	Warnes	21	2,849
7	1	Cochabamba	Sacaba	11	2,720
4	2	La Guardia	Santa Cruz	18	2,383
Sub total				57	2,688
4	3	Cochabamba	Angostura	15	1,957
1	3	Tarapaca	Senkata	5	1,944
6	4	Aeropuerto	Sucre	7	1,884
1	5	Calamarca	Patacamaya	44	1,788
4	6	Suticollo	Vinto	9	1,786
1	7	Tomatas	Tarija	7	1,585
1	8	Senkata	Calamarca	38	1,567
107	1	El Alto	Viacha	21	1,531
1	2	Oruro	Vinto	7	1,485
7	3	Sacaba	Aguirre	38	1,406
1	4	Patacamaya	Sica Sica	22	1,359
4	5	Angostura	Tolata	15	1,253
4	6	Santa Cruz	Cotoca	18	1,238
7	7	Aguirre	Colomi	5	1,189
4519		Punata	Padcaya	4	1,091
4	1	Vinto	P.Parotani	79	1,007
Sub total				254	1,289
TOTAL				369	2,865

BOLIVIA

Table 3

SECOND ROAD MAINTENANCE PROJECT

ROAD VEHICLE FLEET AND
ROAD TRAFFIC VOLUME. 1983 TO 1990

a) Vehicle fleet

Vehicle type	1983	1984	1985	1986	1987	1988	1989	1990
1 Motorcycle	44,524	45,698	46,723	47,379	48,990	37,487	38,762	40,079
2 Car	43,050	46,086	58,441	69,838	72,212	81,568	84,341	87,209
3 Jeep	12,782	13,318	14,577	17,918	18,527	19,480	20,142	20,827
4 Van	15,649	16,807	22,303	27,050	27,970	22,078	33,169	34,296
5 Small truck	24,182	25,978	29,281	38,329	39,632	40,105	41,469	42,879
6 Truck	26,742	28,124	28,819	36,639	37,885	41,540	42,952	44,413
7 Small bus	5,863	5,981	6,031	7,409	7,661	7,833	8,099	8,375
8 Bus	3,357	5,798	3,435	3,862	3,993	6,295	6,509	6,730
9 Ambulance	27	30	30	31	32	64	66	68
10 Tractors	0	0	2	7	7	5	5	5
Sub total	176,176	187,820	209,642	248,462	256,810	266,455	275,514	284,882
Official vehicles	9,233	9,233	9,485	9,523	9,523	9,002	9,002	9,002
Total	185,409	197,053	219,127	257,985	266,433	275,457	284,516	293,884
Annual growth rate		6.3%	11.2%	17.7%	3.3%	6.8%	3.3%	3.3%

b) Road traffic volume, as measured by road transport fuel sales (thousand litres)

Fuel type	1983	1984	1985	1986	1987	1988	1989	1990
Gasoline	452,943	433,753	442,643	462,354	515,672	516,565	531,054	529,312
Diesel	246,520	237,909	236,444	248,510	291,910	300,084	333,753	388,617

c) Fuel consumption per vehicle (litres/year)

	1983	1984	1985	1986	1987	1988	1989	1990
Gasoline power	4,193	3,768	3,184	2,706	2,919	2,681	2,665	2,569
Diesel power	5,815	4,980	5,205	4,356	4,949	4,454	4,791	5,395
Average	4,564	4,057	3,584	3,039	3,328	3,051	3,109	3,160

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Table 4

SECOND ROAD MAINTENANCE PROJECT

ROAD TRANSPORT FUEL PRICE STRUCTURE,
FUEL CONSUMPTION AND USER CHARGE REVENUE, 1991

		Premium gasoline	Special gasoline	Diesel	Kerosene	Total
Ex refinery price	Bs/litre	0.71	0.49	0.36	0.29	
Dealer's margin	Bs/litre	0.11	0.07	0.06	0.02	
Transport allowance	Bs/litre	0.03	0.03	0.03	0.01	
Wholesale price	Bs/litre	0.84	0.60	0.44	0.32	
Government taxes	Bs/litre	1.37	0.97	0.72	0.59	
Producer's price	Bs/litre	0.74	0.52	0.39	0.31	
Price to consumer	Bs/litre	2.10	1.49	1.10	0.90	
Consumer price						
US\$ litre	US\$/litre	0.59	0.42	0.31	0.25	
US\$ gallon	US\$/gallon	2.24	1.59	1.17	0.96	
US\$ barrel	US\$/barrel	94.6	57.1	49.5	40.5	
Opportunity cost and road user charge (US\$ per litre)						
Border price	US\$/litre	0.17	0.17	0.16	0.14	
Distribution costs (est.)	US\$/litre	0.12	0.12	0.12	0.10	
Opportunity cost	US\$/litre	0.29	0.29	0.28	0.24	
Price to consumer	US\$/litre	0.59	0.42	0.31	0.25	
User charge part of price	US\$/litre	0.30	0.13	0.03	0.01	
Consumer price/ opportunity cost		2.01	1.45	1.09	1.06	
Sales for transport use						
Sales 1990	million litres	23,938	473,493	275,235	27,255	799,921
Increase (%) 1991		4.00%	4.00%	4.00%	2.00%	4.00%
Sales 1991	million litres	24,896	492,433	286,244	27,800	831,373
Revenues						
Gross revenue	US\$ million	14.73	206.68	88.70	7.05	317.15
Producer revenue	US\$ million	5.89	82.67	35.48	2.82	126.86
Government revenue	US\$ million	8.84	124.01	53.22	4.23	190.29
User charge revenue	US\$ million	7.40	64.36	7.58	0.38	79.72

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Table 5

SECOND ROAD MAINTENANCE PROJECT

DEVELOPMENT OF THE HIGHWAY NETWORK

YEAR		Paved km	Gravel km	Earth km	Total km
1975	(SNC's Statistics)	1,166	6,559	29,831	37,556
1977	" "	1,289	6,798	30,741	38,828
1979	" "	1,327	6,760	30,741	38,828
1981	" "	1,395	7,987	30,442	39,824
1983	" "	1,538	9,268	30,181	40,987
1985	" "	1,554	9,850	29,627	41,031
1987	" "	1,645	9,880	29,910	41,435
1989	" "	1,776	10,942	28,968	41,686
1991	(New Inventory)	1,584 (*)	11,139	28,963	41,686

(*) Pavement of 192 Km of paved roads disintegrated and downgraded to gravel roads, due to lack of adequate maintenance.

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SECOND ROAD MAINTENANCE PROJECT

TABLE 6

CONDITION OF NATIONAL ROAD NETWORK, 1991

	GOOD km	FAIR km	BAD km	VERY BAD km	TOTAL km	% BAD OR VERY BAD
a) Principal network						
Paved	122	775	475	-	1,372	34.6
Gravel	-	958	3,100	-	4,058	76.4
Earth	-	24	596	-	620	96.1
Sub total	122	1,757	4,171	-	6,050	68.9
b) Secondary Network						
Paved	2	33	55	-	90	61.1
Gravel	14	601	2,106	-	2,721	77.4
Earth	-	214	1,665	-	1,879	88.6
Sub total	16	848	3,826	-	4,690	81.6
c) Feeder Roads						
Paved	35	21	66	-	122	54.1
Gravel	35	1,193	3,001	131	4,360	71.8
Earth	-	509	4,867	21,088	26,464	98.1
Sub total	70	1,723	7,934	21,219	30,946	94.2
d) Total network						
Paved	159	829	596	0	1,584	37.6
Gravel	49	2,752	8,207	131	11,139	74.9
Earth	0	747	7,128	21,088	28,963	97.4
TOTAL	208	4,328	15,931	21,219	41,686	89.1
Percentage of total	0.5	10.4	38.2	50.9	100.0	

(*) Very Bad includes all roads that cannot be efficiently maintained due to their geometric conditions and lack of drainage.

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SECOND ROAD MAINTENANCE PROJECT

ROAD INVESTMENT PLAN, 1992 TO 1996

SUMMARY

a) By project type and funding source	1992/96 Local TGN	1992/96 Local FFAL	1992/96 Local Total	1992/96 Foreign	1992/96 Total	
a) Studies	4,220	200	4,420	9,860	14,280	
b) New Construction	73,301	68,170	141,471	418,001	559,472	
c) Bridges	8,707	0	8,707	0	8,707	
d) Maintenance	3,500	52,832	56,332	161,440	217,772	
e) Rural Roads	17,800	0	17,800	14,760	32,560	
Total	107,528	121,202	228,730	604,061	832,791	
Percentage						
b) By project type and year	1992	1993	1994	1995	1996	Total
a) Studies	2,530	5,230	3,420	1,850	1,250	14,280
b) New Construction	44,999	125,753	121,035	130,673	137,012	559,472
c) Bridges	707	2,000	2,000	2,000	2,000	8,707
d) Maintenance	52,832	93,065	66,875	5,000	0	217,772
e) Rural Roads	14,060	3,625	3,625	3,625	7,625	32,560
Total	115,128	229,673	196,955	143,148	147,887	832,791
c) By funding source and year	1992	1993	1994	1995	1996	Total
Local funds - TGN	22,359	27,436	23,656	15,424	18,653	107,528
Local funds - FFAL	29,184	29,825	25,794	20,374	16,025	121,202
Sub total local	51,543	57,261	49,450	35,798	34,678	228,730
Foreign	63,585	172,412	147,505	107,350	113,209	604,061
Total	115,128	229,673	196,955	143,148	147,887	832,791

Notes:
FFAL indicates the Fondo Fiducial de Aportes Locales
TGN signifies the National Treasury (Tesoro General de la Nacion)

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Table 8

SECOND ROAD MAINTENANCE PROJECT

CURRENT REVENUE AND EXPENDITURE OF SNC: 1991 TO 1996

Revenues	Proj. 1991 US\$m	Proj. 1992 US\$m	Proj. 1993 US\$m	Proj. 1994 US\$m	Proj. 1995 US\$m	Proj. 1996 US\$m
Treasury transfers	17.6	14.5	14.5	16.3	15.6	17.0
Own funds (tolls)	8.0	12.1	14.0	13.8	16.0	16.7
Foreign loans						
Other						
Internal loans						
Fondo de Finan. de Aporte Local (FFAL)						
Total	25.6	26.6	28.5	30.1	31.6	33.7
Expenses	Proj. 1991 US\$m	Proj. 1992 US\$m	Proj. 1993 US\$m	Proj. 1994 US\$m	Proj. 1995 US\$m	Proj. 1996 US\$m
Staff	11.4	12.3	12.3	12.3	12.3	12.3
Services	5.6	4.9	5.0	5.0	5.0	5.0
Materials	7.0	7.1	7.1	7.5	7.9	8.5
Spare Parts and Tires	1.6	2.3	4.0	5.3	6.4	7.9
Total	25.6	26.6	28.4	30.1	31.6	33.7
Inflation rate	0.2	0.2	0.2	0.2	0.2	0.2
Exchange rate (Bs per US\$)	3.7	4.2	4.9	5.6	6.4	7.4

Notes:

Materials costs assumed to reduce with improved efficiency and contracting as a result of SAM/SAE
 Non wage costs of staff assumed to reduce from 80% to 50% of staff costs from 1992

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Table 9

SECOND ROAD MAINTENANCE PROJECT

SNC CURRENT AND CAPITAL REVENUE AND EXPENDITURE, 1985 TO 1990

Revenue	1985	1986	1987	1988	1989	1990
	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
National treasury	6.6	37.1	28.2	15.4	15.6	45.8
Operating revenue	1.6	5.9	6.5	7.3	7.7	7.7
External funds	36.8	70.4	51.2	50.8	51.6	38.0
Other revenues	2.2	5.7	7.5	6.0	0.9	0.4
Internal credit	0.0	0.0	0.0	0.0	0.0	0.0
Financial fund	0.0	0.0	1.7	7.5	0.8	0.0
Total	47.1	119.0	95.0	86.9	76.5	92.0

Expenditure	1985	1986	1987	1988	1989	1990
	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
Staff	3.4	7.4	9.5	10.7	9.5	9.7
Services	1.6	4.2	11.2	3.2	4.4	4.7
Material	0.6	3.5	3.7	4.1	6.2	7.1
Investment	39.4	98.1	63.1	64.6	55.7	70.0
Reserves	0.0	1.8	5.0	1.1	0.3	0.1
Balance	2.1	3.9	2.7	3.3	0.4	0.3
Total	47.1	119.0	95.0	86.9	76.5	92.0

Maintenance expenditure	1985	1986	1987	1988	1989	1990
	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
Routine	1.4	3.3	12.7	10.9	11.9	n/a
Periodic	0.0	0.8	0.6	0.2	0.4	n/a
Improvements	0.1	0.3	1.5	0.3	1.3	n/a
Total	1.5	4.4	14.8	11.5	13.6	n/a

Maintenance expenditure	1985	1986	1987	1988	1989	1990
Routine	93.8%	75.9%	85.6%	95.2%	86.9%	n/a
Periodic	2.2%	17.2%	4.1%	2.0%	3.3%	n/a
Improvements	4.0%	6.9%	10.3%	2.7%	9.8%	n/a
Total	100.0%	100.0%	100.0%	100.0%	100.0%	n/a

Note: Revenues and Costs for 1985 expressed in US\$ are unreliable because of exceptionally high inflation and unstable exchange rates.

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Table 10

SECOND ROAD MAINTENANCE PROJECT

PROJECTION OF COSTS AND EXPENDITURE OF ROAD INFRASTRUCTURE

Costs						

Activity	1996	1997	1998	1999	2000	2001
	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m

Maintenance						
Routine	7.5	7.8	8.1	8.3	8.6	8.9
Emergency	1.1	1.1	1.1	1.1	1.1	1.1
Bridges	1.3	1.3	1.3	1.3	1.3	1.3
Administration	2.6	2.6	2.7	2.7	2.8	2.8
Periodic	20.0	35.0	40.0	45.0	50.0	52.7
Subtotal	32.5	47.8	53.2	58.4	63.8	66.8
Amortization	21.9	21.9	27.0	24.3	21.5	21.5
Counterpart	0.2					
Subtotal	22.1	21.9	27.0	24.3	21.5	21.5
New Construction						
Amortization	62.0	50.2	51.9	51.0	51.0	50.9
Counterpart	19.0	10.0	6.0	7.0	6.0	6.0
Subtotal	81.0	60.2	57.9	58.0	57.0	56.9
TOTAL COSTS	135.6	129.9	138.1	140.7	142.3	145.2
Investment						
New Construction	137.0	100.0	100.0	100.0	100.0	100.0
TOAL EXPENDITURE	169.5	147.8	153.2	158.4	163.8	166.8

Notes: Total Expenditure includes all capital investment, independently of the financing source.
 Maintenance costs exclude SNC current expenditure on new construction.
 Investment in new construction is taken from Annex 2.

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Table 11

SECOND ROAD MAINTENANCE PROJECT

IDA TRANSPORT SECTOR PROJECTS, 1978 TO 1990

Number	Title	Year	Credit Amount US\$ million	Disbursed %
0346	First Railway Maintenance Project	1972	8.0	100%
1121	Second Railway Maintenance Project	1974	32.0	87%
1422	Third Railway Maintenance Project	1977	30.3	100%
1423	Civil Aviation Project	1977	25.0	95%
1587	First Highway Maintenance Project	1978	25.0	100%
1703	Reconstruction and Import Credit I	1986	7.5	99%
1828	Reconstruction and Import Credit II	1988	8.6	86%
2012	Export Corridors Project	1988	37.0	39%
	Reconstruction and Import Credit (OECF)	1988	2.2	55%

Amounts for RIC's refer only to Transport Sector components of credits.

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Table 12 (i)

PERIODIC MAINTENANCE BY CONTRACT PAVED ROAD PROGRAM (1992 - 1995)

CODE	ROAD SECTION	LENGTH	WIDTH	SURFACE	AADT	PROPOSED IMPROVEMENT	ERR %	1992	1993	1994	1995	COST/
								US\$	US\$	US\$	COST	
				(*)		(**)						
ALVI	EL ALTO-VIACHA	21.20	7.30	AC	1083	AC	51.20	1,718,218.00				81,048
LPCO	LA PAZ-COTAPATA	38.50	7.30	DST	556	DST	16.60	1,766,607.00				45,886
WAMO	WARNES-MONTERO	19.60	7.30	AC	1960	AC	28.00	1,848,485.00				94,310
SC02	SAN ISIDRO-LA PALIZADA	7.19	6.00	AC	156	DST	27.50	383,225.27				53,300
SC03	LA PALIZADA-ABRA DEL GUINE	8.85	8.00	GR***	175	DST	28.30	471,702.88				53,300
SC03	ABRA DEL GUINE-MATARAL	19.46	5.80	DST	175	DST	28.30	1,037,213.33				53,300
SC04	MATARAL-AGUA CLARA	26.00	5.80	DST	235	DST	58.10	1,385,793.76				53,300
SC04	AGUA CLARA-MAIRANA	24.50	5.80	GR	235	DST	58.10	1,305,844.12				53,300
SC05	TARUMA-LA GUARDIA	35.55	6.00	AC	939	SST	23.30	607,409.00				17,086
TOTAL KM.		200.85										
V10U	QUILLACOLLO-VINTO	4.50	7.30	AC	4002	AC	59.50		241,218			53,604
V15U	VINTO-SUTICOLLO	8.50	7.30	AC	1620	AC	40.20		487,544			57,358
SUPA	SUTICOLLO-PAROTANI	13.02	7.30	AC	882	AC	38.90		1,077,063			82,724
COPA	PAROTANI-COPIFAL	78.25	7.30	AC	689	AC	21.50		6,078,561			77,681
SC08	GUABIRA-KM 24	24.30	6.00	DST	600	DST	43.10		2,094,660			86,200
SC08	KM 24-OKINAMA	22.74	8.00	EA***	600	DST	43.10		2,749,853			120,926
ORVI	ORURO-VINTO	5.00	7.00	DST	1144	DST	86.40		140,149			28,030
VINA	VINTO-MACHACAMARCA	26.84	7.00	DST	491	DST	23.00		1,222,092			45,532
SC09	GUABIRA-MINEROS	25.92	6.00	DST	1267	DST	45.80		2,138,711			82,512
SC10	MINEROS-CHANE	16.91	8.00	GR***	466	DST	33.80		2,022,339			119,594
TOTAL KM.		225.98										
CB01	COCHABAMBA-ANGOSTURA	14.68	7.00	DST	1841	AC	79.70			1,027,600		70,000
CB02	ANGOSTURA-TOLATA	14.74	7.00	DST	1277	AC	50.70			1,031,800		70,000
CB03	TOLATA-PARACAYA	11.46	7.00	DST	897	AC	33.00			802,200		70,000
RSHU	RIO SECO-HUARINA	56.20	7.00	DST	735	DST	41.40			1,967,000		35,000
HUTI	HUARINA-TIQUINA	39.00	7.00	DST	335	DST	27.00			1,365,000		35,000
TOTA	TOMATAS-TARIJA	3.50	7.30	AC	1748	SST	63.00			65,800		18,800
TASA	TARIJA-Cr. SAN GERONIMO	5.70	7.30	AC	997	SST	52.50			107,160		18,800
SAPA	Cr. SAN GERONIMO-PADCCAYA	40.00	7.30	AC	324	SST	30.80			752,000		18,800
TOTAL KM.		185.28										
CB04	PARACAYA-LA VILLA	5.49	7.00	DST	468	DST	72.00				219,600	40,000
CB05	LA VILLA-EPIZANA	79.55	5.70	DST	222	DST	20.90				3,182,000	40,000
CB06	EPIZANA-POJO	73.80	5.50	DST	135	DST	39.90				2,952,000	40,000
TOLA	TOLATA-CLIZA	7.20	7.30	DST	948	DST	41.10				288,000	40,000
PARA	PARACAYA-PUNATA	3.00	7.00	DST	925	DST	62.90				120,000	40,000
TOTAL KM.		169.04										
TOTAL GENERAL		781.15						10,524,498.36	18,252,190.00	7,118,560.00	6,761,600.00	

(*) AC = Asphalt Concrete; DST = Double Surface Treatment; GR = Gravel EA = Earth
 (**) AC = Asphalt Concrete Overla DST = Double Surface Treatment; SST = Single Surface Treatment
 (***) Disintegrated DST

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SECOND ROAD MAINTENANCE PROJECT

Table 12 (ii)

PERIODIC MAINTENANCE BY CONTRACT PAVED ROAD PROGRAM (1992 - 1995)
COST SUMMARY BY PROJECT TYPE

DESCRIPTION	FIRST YEAR 1992		SECOND YEAR 1993		THIRD YEAR 1994		FOURTH YEAR 1995		TOTAL	TOTAL
	KM	\$US	KM	\$US	KM	\$US	KM	\$US	KM	\$US
A) OVERLAY AND IMPROVEMENT	40.80	3,566,703.00	104.27	7,884,686.00	40.88	2,861,600.00			185.95	14,312,689.00
B) SURFACE TREATMENT AND IMPROVEMENT	124.50	6,350,386.36	121.71	10,367,504.00	95.20	3,332,000.00	169.04	6,761,600.00	510.45	26,811,790.36
C) SEALING AND IMPROVEMENT	35.55	607,409.00	0.00	0.00	49.20	924,960.00			84.75	1,532,369.00
	200.85	10,524,498.36	225.98	18,252,190.00	185.28	7,118,560.00	169.04	6,761,600.00	781.15	42,656,848.36

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Table 13
.....

PERIODIC MAINTENANCE BY CONTRACT GRAVEL ROAD NETWORK

CODE	ROAD SECTION	LENGTH	WIDTH	SURFACE	A D T	PROPOSED	ERR %	1992	1993	1994	1995
				(*)		IMPROVEMENT (**)		US\$	US\$	US\$	US\$
	HUARINA-ACHACACHI	18.00	6.5	GR	330	RGR	43.9	520,320.00			
	ACHACACHI-ANCORAIMES	36.05	6.5	GR	200	RGR	86.2	764,870.00			
	VILLA TUNARI-ETERAZAMA	26.95	9.0	GR	495	RGR	122.2	501,026.00			
	QUILLACOLLO-BELLA VISTA	8.41	7.5	GR	219	RGR	114.5	141,206.00			
	SAN MIGUEL-SAN FRANCISCO	29.55	5.0	GR	225	RGR	41.4	567,497.00			
	LA LOHA-AROMA	11.52	6.0	GR	229	RGR	16.3	317,844.00			
	INGENIO MORA-SAN JOAQUIN	11.68	3.5	GR	129	RGR	15.8	496,646.00			
	OKINAWA-PUERTO BANEGAS	13.00	6.0	GR	280	RGR	19.9	522,945.00			
	CR.RT.4-QUISUSILLAS	30.99	4.0	GR	89	RGR	18.2	1,198,718.00			
	TEXAS-CANDELARIA	21.76	4.5	GR	146	RGR	15.6	1,043,756.00			
	ANCORAIMES-ESCOVA	39.89	6.0	GR	145	RGR	54.7	512,055.00			
	LA PALIZADA-PUENTE	43.84	3.5	GR	104	RGR	24.4	1,269,375.00			
	TOTAL KM.	291.64									
	EL ALTO-CHACALTAYA	10.82	5.0	GR	110	RGR	22.1		254,872.00		
	CR.RT.7-PTO.VILLARROEL	26.41	10.0	GR	240	RGR	26.9		479,837.00		
	CR.RT.4-CAPINOTA--IRPA IRPA	26.68	5.5	GR	282	RGR	111.2		481,052.00		
	POJO-LINITE DESTRIAL	36.21	8.0	GR	135	RGR	90.4		701,658.00		
	MATARAL-VALLE GRANDE	52.23	6.0	GR	65	RGR	20.8		937,879.00		
	MAORECITAS-SAN NICOLAS	15.98	4.5	GR	108	RGR	15.6		591,090.00		
	FINITE DISTRIAL-COMARAPA	23.63	6.5	GR	131	RGR	107.3		375,261.00		
	COMARAPA-SAN ISIDRO	19.04	5.5	GR	156	RGR	179.1		247,730.00		
	YAPACANI-COLONIA SAN JUAN	13.70	10.0	GR	247	RGR	119.0		180,511.00		
	TOTAL KM.	224.70									
	MALLASA-VALENCIA	14.00	5.5	GR	157	RGR	39.6			364,224.00	
	CR.RT.4-EL PASO	4.95	5.5	GR	338	RGR	177.7			99,528.00	
	ATQUILE-EPIZANA	89.00	6.0	GR	110	RGR	74.1			1,476,332.00	
	YAMPARAEZ-TARABUCO	36.00	6.0	GR	129	RGR	39.3			597,168.00	
	TOTAL KM.	143.95									
	ORURO-CAPACHOS-PARIA	21.00	7.0	GR	326	RGR	24.0				546,336.00
	MACHACAMARCA-HUARUNI	22.00	7.0	GR	217	RGR	91.6				572,352.00
	SUCRE-YAMPARAEZ	29.00	6.5	GR	145	RGR	51.1				481,052.00
	COBISA-PORVENIR	33.00	9.0	GR	299	RGR	27.3				1,150,479.00
	TOTAL KM.	105.00									
	TOTAL GENERAL	765.29						7,856,258.00	4,249,890.00	2,537,252.00	2,750,219.00
	GRAND TOTAL										17,393,619.00

(*) GR = Gravel

(**) RGR = Regravelling

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Table 14 (1)

BRIDGE PROGRAM

BRIDGE	RIVER	ROAD	ADT	TYPE	LENGTH (m)	DECK WIDE (m)	SPANS (No)	TYPE OF WORK	1992	1993	1994	1995
									(US\$ x 1000)			
DISTRICT LA PAZ D-1												
Japones	Desaguadero	Patacamaya-Tambo Quemado	81	PTC	74	3.9	4	M				78.1
Lipary	Choqueri	La Paz-Rio Abajo	157	PTC	102	7.3	3	M		3.2		
Zona Zona	Zona Zona	Aranjuez-Tahuapalca-Pacuaní	157	MX	3.9	4	1	M		1.8		
Tahuapalca		Aranjuez-Tahuapalca-Pacuaní	157	B	175	3.9	1	RP		16.0		
Puerto Leon	Quita Calzon	La Paz-Beni	228	SS	25.3	4.2	2	NC	16.4			
Alto Choro	Choro	La Paz-Beni	228	SS	28.2	3.8	1	RP		15.3		
San Silvestre	Coroico	La Paz-Beni	338	SS	14	4.6	1	RP			11.3	
San Pedro	Coroico	La Paz-Beni	228	SS	37.3	4.2	1	M	5.3			
Velo de la Novia	Unduavi	La Paz-Chulumani	186	MX	9.7	6.4	1	M	3.7			
Pabon	Tomanpaya	La Paz-Coripata	29	SB	50.85	3	3	M			15.9	
Villa	Jankouma	La Paz-Chulumani	170	MX	28	4.5	1	M				
SUB-TOTAL.....									30.3	36.3	27.2	78.1
DISTRICT CHUGUISACA D-2												
Río Grande	R. Grande	Sucre-Epizana	340	MX	124.00	3.8	4	M	6.5			
Mataral	Mataral	Sucre-Epizana	119	SS	54.87	3.8	3	M	3.6			
Tabacal	Tabacal	Sucre-Epizana	119	SS	18.29	3.8	1	M	1.5			
Zudanez	Zudanez	Sucre-Camiri	92	SS	29.80	3.4	1	M		10.7		
Huerta Mayu		Sucre-Epizana	119	SS	13.72	3.8	1	M	1.2			
Arce (colgante)	R. Grande	Sucre-Epizana	340	MX	82.20	3.0	1	RP			44.3	
Cercado	Cercado	Sucre-Epizana	118	MX	28.80	3.8	3	M	1.4			
Neron	Neron	Sucre-Epizana	119	MX	18.29	3.8	1	M	1.5			
Sucre (colgante)	Pilcomayu	Sucre-Potosi	126	MX	175.00	3.2	1	RH				127.4
Arquillos		Sucre-Camiri	50	MX	29.80	3.4	1	RP	10.0			
Acero (Pacheco)	Acero	Sucre-Camiri	31	MX	62.00	3.8	1	RP		24.1		
SUB-TOTAL.....									25.8	34.8	44.3	127.4
DISTRICT TARIJA D-3												
San Juan de Oro	San Juan de Oro	Tarija-Potosi	115	MX	93.60	4.3	1	RP	42.0			
Serene	Serene	Tarija-Villamontes	93	MX	19.00	4.2	1	M		7.3		
Canadas	Canadas	Tarija-Villamontes	93	MX	19.00	4.2	1	RP			24.4	
Isiri	Isiri	Tarija-Villamontes	41	MX	22.60	4.0	2	RP				10.6
Las Carreras	San Juan de Oro	Tarija-Potosi	115	MX	30.70	3.6	1	RP	11.9			
SUB-TOTAL.....									53.9	7.3	24.4	10.6
DISTRICT COCHABAMBA D-4												
Puente Ene	Ene	Cbba.-Sta.Cruz	884	PTC	110.30	7.00	3	RP				135.3
Cesarsama	Cesarsama	Cbba.-Sta.Cruz	884	PTC	148.00	7.00	4	RP				117.9
Iviviagarzama	Iviviagarzama	Cbba.-Sta.Cruz	884	PTC	157.20	7.00	4	RP	101.6			
Sacta	Sacta	Cbba.-Sta.Cruz	884	PTC	916.00	7.35	20	RP	96.8			
Chípiriri	Chípiriri	Cbba.-Trinidad	235	PTC	36.60	7.00	1	RP		47.6		
Bombarazama	Bombarazama	Cbba.-Trinidad	235	PTC	29.00	7.00	1	RP		58.7		
Eterazama	Eterazama	Cbba.-Trinidad	235	PTC	137.10	7.00	4	RP		73.0		
San Pablo	San Pablo	Cbba.-Trinidad	235	PTC	25.00	7.00	1	RP			81.2	
Chaquimayu	Chaquimayu	Cbba.-Chapare	4937	PTC	25.00	7.00	2	RP			80.3	
Lacayani	Lacayani	Cbba.-Oruro	756	PTC	130.00	10.00	3	RP	29.3			
Viloma	Viloma	Cbba.-Oruro	1734	PTC	270.16	8.00	9	RP		90.0		
Copachuncho	Copachuncho	Cbba.- Sta. Cruz	443	RC	64.25	7.04	5	RP			141.9	
SUB-TOTAL.....									227.6	269.3	303.4	253.2
TYPE OF WORK												
TYPE OF WORK		TYPE OF BRIDGE										
RP= REPAIR		B =STONE										
RH= REHABILITATION		SS =STEEL STRUCTURE										
RC= RECONSTRUCTION		SB =SUSPENSION BRIDGE										
NC= NEW CONSTRUCTION		RC =REINFORCED CONCRETE										
M = MAINTENANCE		PTC=PRESTRESSED CONCRETE										
		BB =BAILEY BRIDGE										
		MX =MIX										

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Table 14 (ii)

BRIDGE PROGRAM

BRIDGE	RIVER	ROAD	ADT	TYPE	LENGTH (m)	DECK WIDE (m)	SPANS (No)	TYPE OF WORK	1992	1993	1994	1995		
									(US\$ x 1000)					
DISTRICT SANTA CRUZ D-5														
Comarapa	Comarapa	Sta.Cruz-Cbba.	135	RC	45.6	6.9	4	M	99.0					
Tiquipampa	Tiquipampa	Sta.Cruz-Cbba.	156	RC	11.0	8.8	1	M	52.3					
La Pascana	Pascana	Sta.Cruz-Cbba.	156	RC	11.4	6.9	1	M	26.7					
El Tambo	El Tambo	Sta.Cruz-Cbba.	156	RC	11.4	6.9	1	M	26.0					
San Isidro	S. Isidro	Sta.Cruz-Cbba.	156	RC	52.0	6.9	4	M	122.2					
La Palizada	La Palizada	Sta.Cruz-Cbba.	175	RC	11.4	6.9	1	M		90.5				
El Quilco	Quilco	Sta.Cruz-Cbba.	175	RC	11.4	6.9	1	M		45.5				
El Salto	El Salto	Sta.Cruz-Cbba.	175	RC	8.3	7.7	1	M	18.0					
La Hoyada	La Hoyada	Mataral-V. Grande	31	RC	39.0	4.0	3	RP		35.2				
Yapacani	Yapacani	Sta.Cruz-Guabira-Cbba.	822	PTC	702.0	7.0	18	M			282.7			
Chane	Chane	Sta.Cruz-Mineros	466	PTC	78.9	7.6	3	M				106.5		
Taruma	Pirai	Sta.Cruz-Cbba.	279	PTC	90.0	7.3	2	M				161.8		
Las Abejas	Abejas	Sta.Cruz-Cbba.	939	RC	7.6	7.2	1	M			15.5			
San Jose	San Jose	Sta.Cruz-Cbba.	939	RC	50.4	7.0	4	M			75.0			
Guebrada Seca	Quebrada Seca	Sta.Cruz-Cbba.	939	RC	20.0	8.0	1			88.7				
SUB-TOTAL									344.2	259.9	373.1	268.3		
DISTRICT URURO D-6														
Barras II	Barras	Ururo-Turco	86	PTC	80.00	4.00	4	M	13.5					
Huaraco	Huaraco	Ururo-La Paz	883	RC	12.00	12.00	1	M	50.0					
Colloma	Colloma	Uncia-Nequeta	55	RC	55.80	7.30	3	RP				190.8		
Sica Sica	Sica Sica	Ururo-La Paz	752	RC	45.00	10.00	3	M	0.8					
Kara	Kara	Licoma-Canamina	20	RC	14.40	4.00	1	RP	35.6					
Katu	Katu	Cr.Cohani-Canamina	20	MX	18.30	4.00	1	M		8.0				
Aroma	Desaguadero	Ururo-Pisiga	102	PTC	76.32	4.00	4	RP		39.0				
Barras I	Barras	Ururo-Pisiga	102	PTC	80.00	4.00	4	RP		23.9				
Caracollo	Caracollo	Ururo-La Paz	718	RC	45.00	4.00	4	RP			76.0			
Machacamarcá	Machacamarcá	Ururo-Potosi	533	PTC	129.00	7.30	5	M	0.9					
Tacagua	Tacagua	Ururo-Potosi	172	PTC	52.00	7.30	2	RP		42.1				
Lauca Huachacalla	Lauca	Ururo-Pisiga	102	PTC	100.00	4.00	4	M				9.0		
La Joya	La Joya	Caracollo-La Joya	102	PTC	80.00	4.00	4	RP				13.0		
Espanol	Desaguadero	Ururo-Pisiga	103	RC	25.00	7.30	1	RP	1.8					
Carasilla	Carasilla	Ururo-Pisiga	103	PTC	76.40	3.77	4	RP			2.0			
Colorado	Colorado	Uncia-Pocosta	103	RC	43.20	4.00	3	RP				1.6		
SUB-TOTAL									102.7	113.0	77.9	214.4		
DISTRICT POTOSI D-7														
Mayutambo	Mayutambo	Potosi-Sucre	263	RC	42.50	7.00	2	RP	8.1					
Chaquimayu	Chaquimayu	Potosi-Sucre	263	RC	64.00	7.00	3	RP	12.8					
Negro Tambo	Negro Tambo	Potosi-Sucre	263	MX	9.70	7.30	1	RP	2.4					
Mataca	Mataca	Cr.Ruta 7200-Turuchipa	11	SB	80.00	3.00	1	M	39.6					
Mojona	Mojona	Potosi-Tarija	150	SS	25.00	3.40	1	RP	60.0					
Quebrada Honda	Q. Honda	Potosi-Tarija	94	SS	25.00	3.40	1	RP	13.1					
La Torre	La Torre	Potosi-Tarija	94	SS	25.00	3.40	1	RP	21.8					
SUB-TOTAL									157.8					
TOTAL									942.5	720.6	850.3	951.9		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> TYPE OF WORK RP= REPAIR RH= REHABILITATION RC= RECONSTRUCTION NC= NEW CONSTRUCTION M = MAINTENANCE </td> <td style="width: 50%; vertical-align: top;"> TYPE OF BRIDGE B =STONE SS =STEEL STRUCTURE SB =SUSPENTION BRIDGE RC =REINFORCED CONCRETE PTC=PRESTRESSED CONCRETE BB =BAILEY BRIDGE MX =MIX </td> </tr> </table>													TYPE OF WORK RP= REPAIR RH= REHABILITATION RC= RECONSTRUCTION NC= NEW CONSTRUCTION M = MAINTENANCE	TYPE OF BRIDGE B =STONE SS =STEEL STRUCTURE SB =SUSPENTION BRIDGE RC =REINFORCED CONCRETE PTC=PRESTRESSED CONCRETE BB =BAILEY BRIDGE MX =MIX
TYPE OF WORK RP= REPAIR RH= REHABILITATION RC= RECONSTRUCTION NC= NEW CONSTRUCTION M = MAINTENANCE	TYPE OF BRIDGE B =STONE SS =STEEL STRUCTURE SB =SUSPENTION BRIDGE RC =REINFORCED CONCRETE PTC=PRESTRESSED CONCRETE BB =BAILEY BRIDGE MX =MIX													

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Table 15 (1)

SECOND ROAD MAINTENANCE PROJECT

PROJECTED MAINTENANCE EXPENDITURE BY YEAR AND AGENCY

	1992			1993			1994		
	SNC US\$m	IDA US\$m	Total US\$m	SNC US\$m	IDA US\$m	Total US\$m	SNC US\$m	IDA US\$m	Total US\$m
a) Maintenance by Contract									
Periodic maintenance - Paved	0.0	0.2	0.2	3.5	14.0	17.5	3.8	15.4	19.2
Periodic maintenance - Gravel	0.0	0.2	0.2	0.9	4.0	4.9	1.6	5.8	7.4
Sub total Contract	0.0	0.4	0.4	4.4	18.0	22.4	5.4	21.2	26.6
b) Maint. by Force Account									
Personnel	12.3	0.0	12.3	12.3	0.0	12.3	12.3	0.0	12.3
Tires	1.3	0.0	1.3	1.7	0.0	1.7	1.8	0.0	1.8
Fuel and lubricants	6.8	0.0	6.8	6.7	0.0	6.7	6.9	0.0	6.9
Spare parts	2.0	0.0	2.0	6.5	0.0	6.5	7.2	0.0	7.2
Road materials	0.3	0.0	0.3	1.4	0.0	1.4	1.6	0.0	1.6
Miscellaneous	4.9	0.0	4.9	5.0	0.0	5.0	5.0	0.0	5.0
Sub total Force Account	27.6	0.0	27.6	33.6	0.0	33.6	34.8	0.0	34.8
c) Other project components									
Bridge maintenance			0.0	0.3	1.3	1.6	0.2	0.7	0.9
Workshop Compound Construction			0.0	0.5	1.2	1.7	0.1	0.3	0.4
Equipment			0.0	0.8	2.0	2.8	0.7	1.4	2.1
Road Safety			0.0	0.0	0.0	0.0	0.5	1.1	1.6
Institutional strengthening		0.3	0.3	0.0	0.6	0.6	0.0	0.8	0.8
Subtotal Other	0.0	0.3	0.3	1.6	5.1	6.7	1.5	4.3	5.8
Procurement Agencies			0.0		1.0	1.0		1.2	1.2
Total Base Cost	27.6	0.7	28.3	39.6	24.1	63.7	41.7	26.7	68.4
d) Contingencies									
Physical contingencies			0.0	0.8	1.8	2.6	1.2	1.7	2.9
Price contingencies	0.5	0.2	0.7	1.8	2.5	4.3	3.2	3.6	6.8
Sub total	0.5	0.2	0.7	2.6	4.3	6.9	4.4	5.3	9.7
TOTAL	28.1	0.9	29.0	42.2	28.4	70.6	46.1	32.0	78.1

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Table 15 (ii)

SECOND ROAD MAINTENANCE PROJECT

PROJECTED MAINTENANCE EXPENDITURE BY YEAR AND AGENCY

	1995			1996			1992/96		
	SNC US\$m	IDA US\$m	Total US\$m	SNC US\$m	IDA US\$m	Total US\$m	SNC US\$m	IDA US\$m	Total US\$m
a) Maintenance by Contract									
Periodic maintenance - Paved	1.4	5.8	7.2	0.3	1.0	1.3	9.0	36.4	45.4
Periodic maintenance - Gravel	1.1	4.6	5.7	0.1	0.4	0.5	3.7	15.0	18.7
Sub total Contract	2.5	10.4	12.9	0.4	1.4	1.8	12.7	51.4	64.1
b) Maint. by Force Account									
Personnel	12.3	0.0	12.3			0.0	49.2	0.0	49.2
Tires	1.8	0.0	1.8			0.0	6.6	0.0	6.6
Fuel and lubricants	7.3	0.0	7.3			0.0	27.7	0.0	27.7
Spare parts	7.5	0.0	7.5			0.0	23.2	0.0	23.2
Road materials	1.6	0.0	1.6			0.0	4.9	0.0	4.9
Miscellaneous	5.0	0.0	5.0			0.0	19.9	0.0	19.9
Sub total Force Account	35.5	0.0	35.5	0.0	0.0	0.0	131.5	0.0	131.5
c) Other project components									
Bridge maintenance	0.2	0.8	1.0			0.0	0.7	2.8	3.5
Workshop Compound Construction	0.4	1.0	1.4			0.0	1.0	2.5	3.5
Equipment	0.0	0.0	0.0			0.0	1.5	3.4	4.9
Road Safety	0.0	0.0	0.0			0.0	0.5	1.1	1.6
Institutional strengthening		0.8	0.8		0.1	0.1	0.0	2.6	2.6
Subtotal Other	0.6	2.6	3.2	0.0	0.1	0.1	3.7	12.4	16.1
Procurement Agencies		0.8	0.8				0.0	3.0	3.0
Total Base Cost	38.6	13.8	52.4	0.4	1.5	1.9	147.9	66.8	214.7
d) Contingencies									
Physical contingencies	0.5	1.0	1.5		0.0	0.0	2.5	4.5	7.0
Price contingencies	4.1	2.3	6.4		0.1	0.1	9.6	8.7	18.3
Sub total	4.6	3.3	7.9	0.0	0.1	0.1	12.1	13.2	25.3
TOTAL	43.2	17.1	60.3	0.4	1.6	2.0	160.0	80.0	240.0

BOLIVIA

Table 16

SECOND ROAD MAINTENANCE PROJECT

TIME DISTRIBUTION OF PROJECT EXPENDITURE BY FINANCING AGENCY

AGENCY	COSTS	1992	1993	1994	1995	1996	Total	% of
		US\$m	US\$m	US\$m	US\$m	US\$m	US\$m	Total
SNC	Basic	27.6	39.6	41.7	38.6	0.4	147.9	
	Physical Contingency	0.0	0.8	1.2	0.5	0.0	2.5	
	Price Contingency	0.5	1.8	3.2	4.1	0.0	9.6	
	Sub-total	28.1	42.2	46.1	43.2	0.4	160.0	66.7%
IDA	Basic	0.7	24.1	26.7	13.8	1.5	66.8	
	Physical Contingency	0.0	1.8	1.7	1.0	0.0	4.5	
	Price Contingency	0.2	2.5	3.6	2.3	0.1	8.7	
	Sub-total	0.9	28.4	32.0	17.1	1.6	80.0	33.3%
Total	Basic	28.3	63.7	68.4	52.4	1.9	214.7	
	Physical Contingency	0.0	2.6	2.9	1.5	0.0	7.0	
	Price Contingency	0.7	4.3	6.8	6.4	0.1	18.3	
	Total	29.0	70.6	78.1	60.3	2.0	240.0	100.0%

Table 17 (i)

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BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

TENTATIVE LIST OF PACKAGES FOR CONTRACTS
(Periodic Maintenance)

YEAR	ROAD SECTION	TYPE	LENGTH KM	COST (US\$M)	FINANCING IDA SNC	
A) PAVED ROADS						
1	1992 El Alto - Viacha	AC	21.2	1.7	1.4	0.3
2	1992 La Paz - Cotapata	DST	38.5	1.8	1.4	0.4
3	1992 Warnes - Montero	AC	19.6	1.8	1.4	0.4
4	1992 Taruma - La Guardia	SST	35.6	0.6	0.5	0.1
5	1992 San Isidro - La Palizada	DST	7.2	0.4	0.3	0.1
5	1992 La Palizada - Abra del Quine	DST	8.9	0.5	0.4	0.1
5	1992 Abra del Quine - Aguaclara	DST	19.5	1.0	0.8	0.2
5	1992 Mataral - Aguaclara	DST	26.0	1.4	1.1	0.3
5	1992 Mataral - Aguaclara	DST	24.5	1.3	1.0	0.3
	Subtotal		86.1	4.6	3.6	1.0
6	1993 Quillacollo - Vinto	AC	4.5	0.2	0.2	0.0
6	1993 Vinto - Suticollo	AC	8.5	0.5	0.4	0.1
6	1993 Suticollo - Parotani	AC	13.0	1.1	0.9	0.2
6	1993 Parotani - Confital	AC	78.3	6.1	4.9	1.2
	Subtotal		104.3	7.9	6.4	1.5
7	1993 Guabira - Km 24	DST	24.3	2.1	1.7	0.4
7	1993 Km 24 - Okinawa	DST	22.7	2.7	2.2	0.5
	Subtotal		47.0	4.8	3.9	0.9
8	1993 Guabira - Mineros	DST	26.0	2.1	1.7	0.4
8	1993 Mineros - Chane	DST	16.9	2.0	1.6	0.4
	Subtotal		42.9	4.1	3.3	0.8
9	1993 Oruro - Vinto	DST	5.0	0.1	0.1	0.0
9	1993 Vinto - Machamarca	DST	26.8	1.2	1.0	0.2
	Subtotal		31.8	1.3	1.1	0.2
10	1994 Cochabamba - Angostura	AC	14.7	1.0	0.8	0.2
10	1994 Angostura - Tolata	AC	14.7	1.0	0.8	0.2
10	1994 Tolata - Paracaya	AC	11.5	0.8	0.6	0.2
	Subtotal		40.9	2.8	2.2	0.6
11	1994 Rio Seco - Huarina	DST	56.2	2.0	1.6	0.4
11	1994 Huarina - Tiquina	DST	39.0	1.4	1.1	0.3
	Subtotal		95.2	3.4	2.7	0.7

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

TENTATIVE LIST OF PACKAGES FOR CONTRACTS
(Periodic Maintenance)

YEAR	ROAD SECTION	TYPE	LENGTH KM	COST (US\$M)	FINANCING	
					IDA	SNC
12	1994 Tomatas- Tarija	SST	3.5	0.1	0.1	0.0
12	1994 Tarija - S.Geronimo	SST	5.7	0.1	0.1	0.0
12	1994 S.Geronimo - Paracaya	SST	40.0	0.8	0.6	0.2
	Subtotal		49.2	1.0	0.8	0.2
13	1995 Paracaya - La Villa	DST	5.5	0.2	0.2	0.0
13	1995 La Villa - Epizana	DST	79.6	3.2	2.6	0.6
13	1995 Epizana - Pojo	DST	73.8	3.0	2.4	0.6
13	1995 Tolata - Cliza	DST	7.2	0.3	0.2	0.1
13	1995 Paracaya - Punata	DST	3.0	0.1	0.1	0.0
	Subtotal		169.1	6.8	5.5	1.3
	1992/95 Total	AC	186.0	14.2	11.6	2.8
	1992/95 Total	DST	510.6	26.8	21.5	5.3
	1992/95 Total	SST	84.8	1.6	1.3	0.3
	1992/95 GRAND TOTAL	-	781.4	42.6	34.2	8.4

Table 17 (ii)

Page 1

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

TENTATIVE LIST OF PACKAGES FOR CONTRACTS
(Periodic Maintenance)

YEAR	ROAD SECTION	TYPE	LENGTH KM	COST (US\$M)	FINANCING IDA SNC	
B) GRAVEL ROADS						
1	1992 Villa Tunari- Eterazema	GR	27.0	0.5	0.4	0.1
1	1992 Quillacollo - Bella Vista	GR	8.4	0.1	0.1	0.0
1	1992 S. Miguel - S. Francisco	GR	29.6	0.6	0.4	0.2
1	1992 La Loma - Aroma	GR	11.5	0.3	0.2	0.1
	Subtotal		76.5	1.5	1.1	0.4
2	1992 Ingenio Mora - S. Joaquin	GR	11.7	0.5	0.4	0.1
2	1992 Okinawa - Puerto Banegas	GR	13.0	0.5	0.4	0.1
2	1992 Madrecitas - San Nicolas	GR	16.0	0.6	0.5	0.1
	Subtotal		40.7	1.6	1.3	0.3
3	1993 Pojo - Limite Distrital	GR	36.2	0.7	0.5	0.2
3	1993 Limite Distrital - Comarapa	GR	23.6	0.4	0.3	0.1
3	1993 Comarapa - S. Isidro	GR	19.0	0.2	0.2	0.0
	Subtotal		78.8	1.3	1.0	0.3
4	1993 Huarina - Achacachi	GR	18.0	0.5	0.4	0.1
4	1993 Achacachi - Ancoraimes	GR	36.1	0.8	0.6	0.2
4	1993 Ancoraimes - Escome	GR	39.9	0.5	0.4	0.1
4	1993 El Alto - Chacaltaya	GR	10.8	0.3	0.2	0.1
	Subtotal		104.8	2.1	1.6	0.5
5	1993 La Palizada - Puente Tapera	GR	43.8	1.3	1.0	0.3
6	1993 Cruce Ruta 7 - Puerto Villarroel	GR	26.4	0.5	0.4	0.1
6	1993 Cruce Ruta 4 - Irpa Irpa	GR	26.7	0.5	0.4	0.1
	Subtotal		53.1	1.0	0.8	0.2
7	1994 Yapacani - Colonia S. Juan	GR	13.7	0.2	0.2	0.0
7	1994 Materai - Valle Grande	GR	52.2	0.9	0.7	0.2
7	1994 Cruce Ruta 4 - Quirusillas	GR	31.0	1.2	1.0	0.2
7	1994 Texas - Candelaria	GR	21.8	1.0	0.8	0.2
	Subtotal		118.7	3.3	2.7	0.6
8	1994 Mallasa - Valencia	GR	14.0	0.4	0.3	0.1
8	1994 Cruce Ruta 4 - El Pojo	GR	5.0	0.1	0.1	0.0
8	1994 Atquite - Epizana	GR	89.0	1.5	1.2	0.3
	Subtotal		108.0	2.0	1.6	0.4
9	1995 Oruro - Paria	GR	21.0	0.5	0.4	0.1
9	1995 Machacamarca - Huanuni	GR	22.0	0.6	0.5	0.1
	Subtotal		43.0	1.1	0.9	0.2

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

TENTATIVE LIST OF PACKAGES FOR CONTRACTS
(Periodic Maintenance)

YEAR	ROAD SECTION	TYPE	LENGTH KM	COST (US\$M)	FINANCING	
					IDA	SNC
10	1995 Yamparaez - Tarabuco	GR	36.0	0.5	0.5	0.1
10	1995 Sucre - Yamparaez	GR	29.0	0.6	0.4	0.1
	Subtotal		65.0	1.1	0.9	0.2
11	1995 Cobija - Porvenir	GR	33.0	1.2	1.0	0.2
	1992-95 TOTAL		765.4	17.5	13.9	3.6

SECOND ROAD MAINTENANCE PROJECT

ALLOCATION OF IDA CREDIT PROCEEDS

Project component	Amount of the Credit allocated in US\$ equivalent	% of Expenditure financed
i) Periodic maintenance (Paved network)	36,400,000	80%
ii) Periodic maintenance (Gravel network)	15,000,000	80%
iv) Bridge maintenance and rehabilitation	2,800,000	80%
v) Work compound construction	2,500,000	70%
vi) Equipment (rehabilitation)	2,100,000	70%
vii) Equipment (acquisition) & Road Safety Program	2,400,000	100% of foreign expenditures
viii) Institutional Strengthening (Tech. Ass)	2,600,000	100%
ix) Procurement Fees	3,000,000	100%
x) Unallocated	13,200,000	-
TOTAL	80,000,000	-

Source: Mission estimates
July 1991

SECOND ROAD MAINTENANCE PROJECT

ESTIMATED SCHEDULE OF IDA DISBURSEMENTS

	Disbursed in Quarter		Cumulative Disbursements US\$m	Cumulative %
	US\$m	US\$m		
FY 1993				
September 30, 1992	0.0		0.0	0.0%
** December 31, 1992	6.0		6.0	7.5%
March 31, 1993	2.0		8.0	10.0%
June 30, 1993	4.0	12.0	12.0	15.0%
FY 1994				
September 30, 1993	4.0		16.0	20.0%
December 31, 1993	5.6		21.6	27.0%
March 31, 1994	6.4		28.0	35.0%
June 30, 1994	6.4	22.4	34.4	43.0%
FY 1995				
September 30, 1994	6.4		40.8	51.0%
December 31, 1994	6.4		47.2	59.0%
March 31, 1995	6.4		53.6	67.0%
June 30, 1995	5.6	24.8	59.2	74.0%
FY 1996				
September 30, 1995	5.6		64.8	81.0%
December 31, 1995	4.0		68.8	86.0%
March 31, 1996	3.2		72.0	90.0%
June 30, 1996	2.4	15.2	74.4	93.0%
FY 1997				
September 30, 1996	2.4		76.8	96.0%
December 31, 1996	1.6		78.4	98.0%
March 31, 1997	0.8		79.2	99.0%
June 30, 1997	0.8	5.6	80.0	100.0%

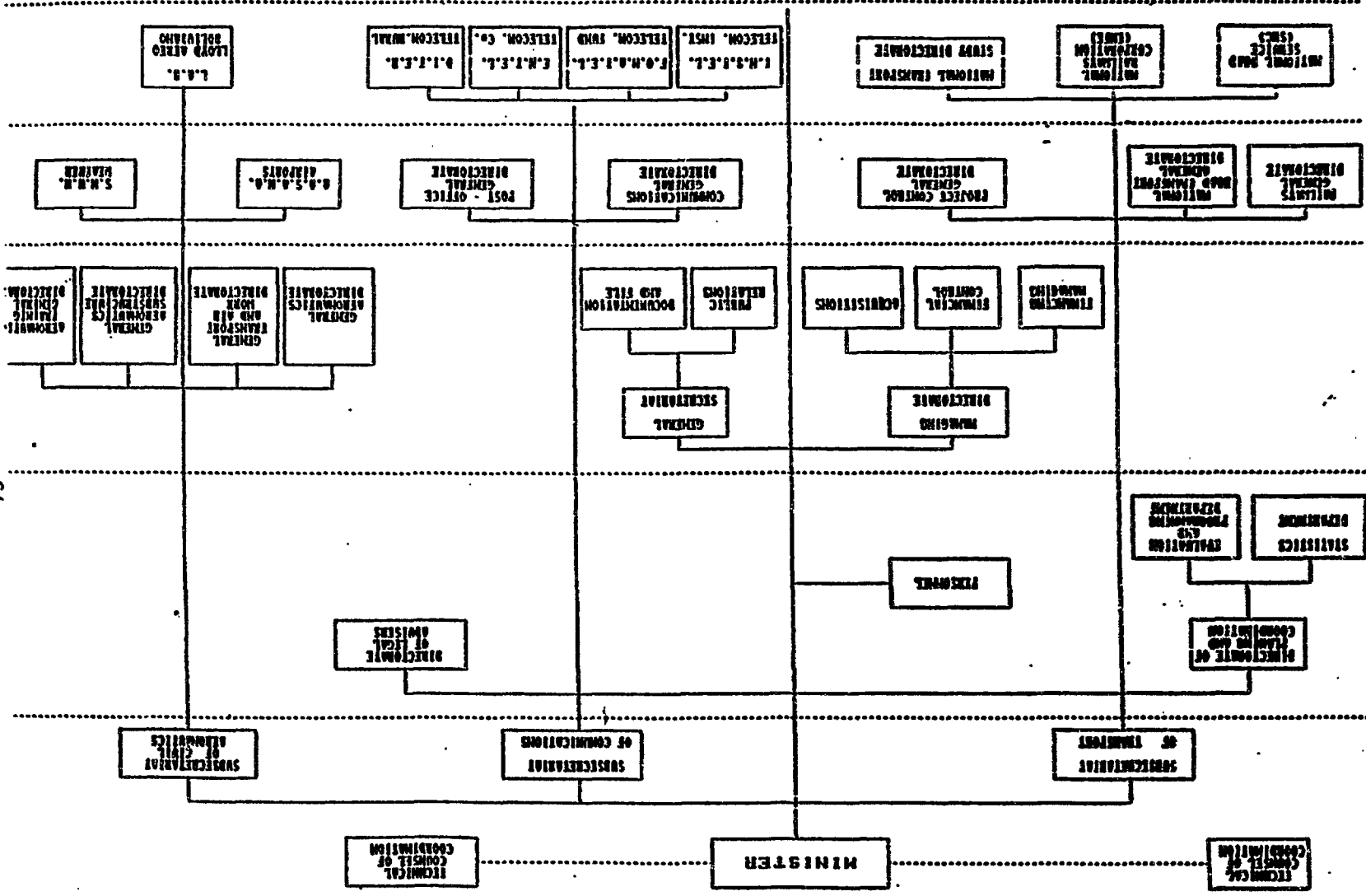
Total	80.0	80.0		

Assumptions:

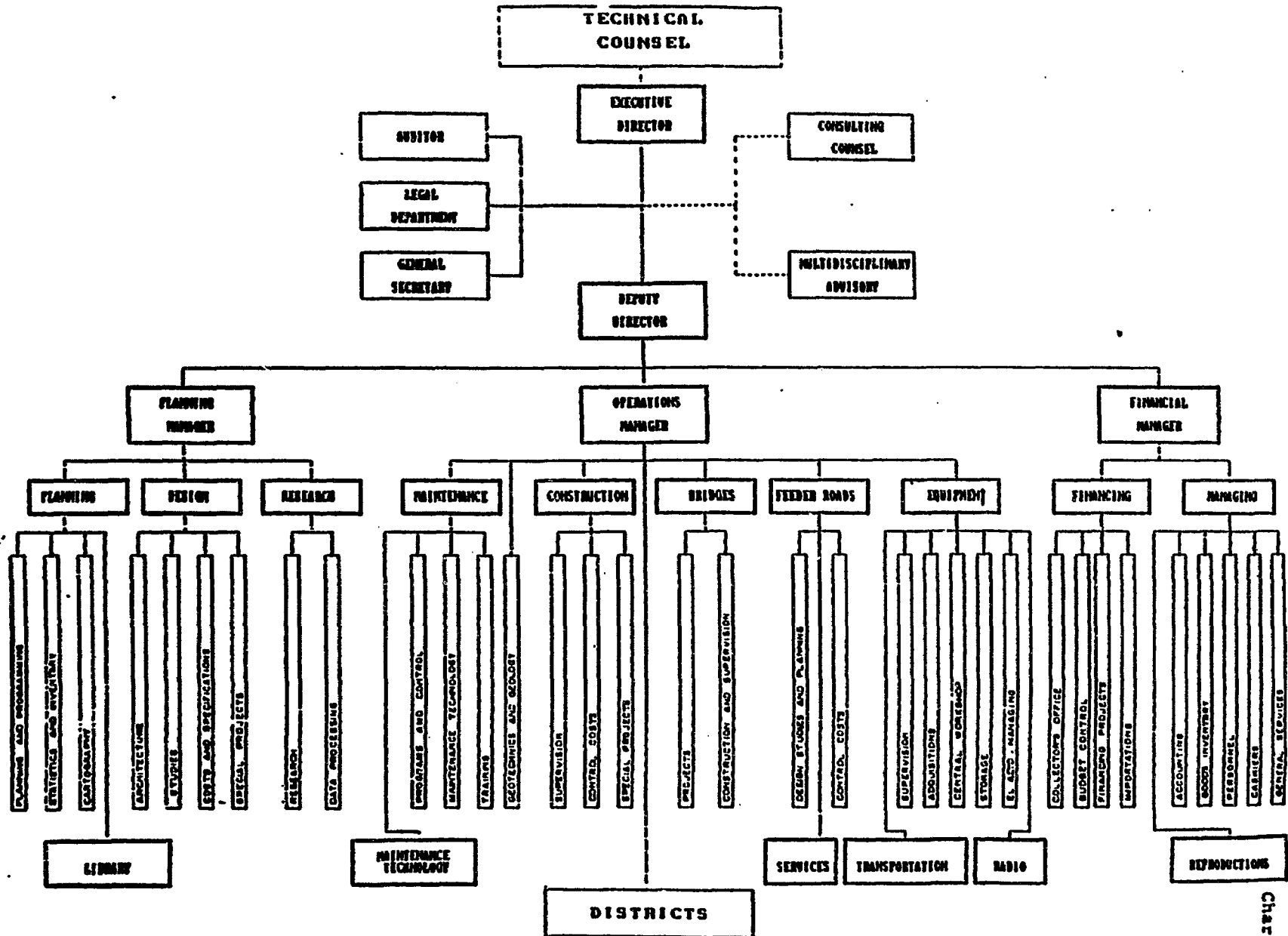
Loan signing date: July 1992
 Loan effectiveness: October 1992
 Project completion: December 31, 1996
 Loan Closing Date: June 30, 1998

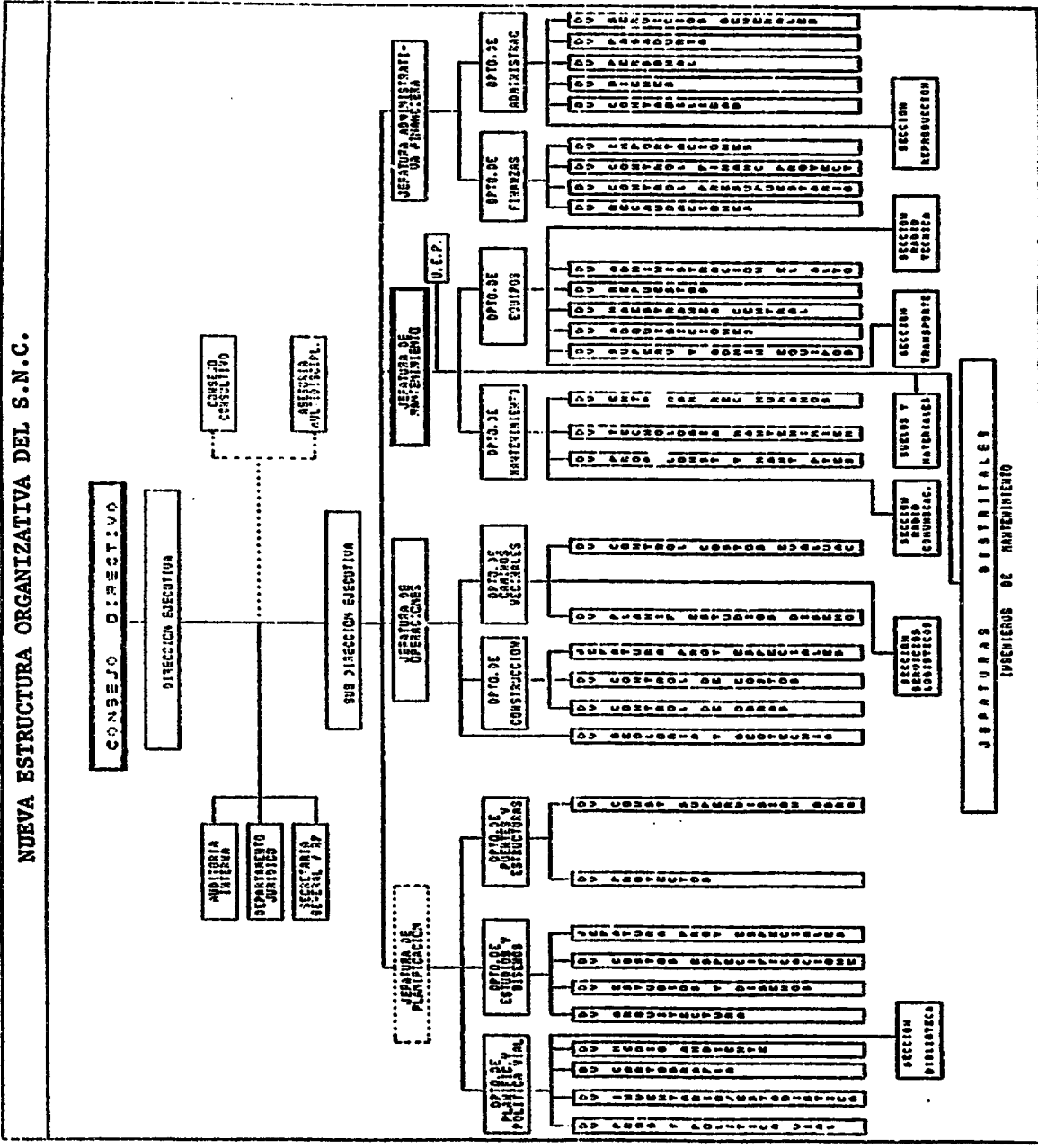
** Includes initial deposit to Special Account and retroactive financing.

MINISTRY OF TRANSPORT, COMMUNICATIONS AND CIVIL AERONAUTICS ORGANIZATION
(BEFORE DECENTRALIZATION)

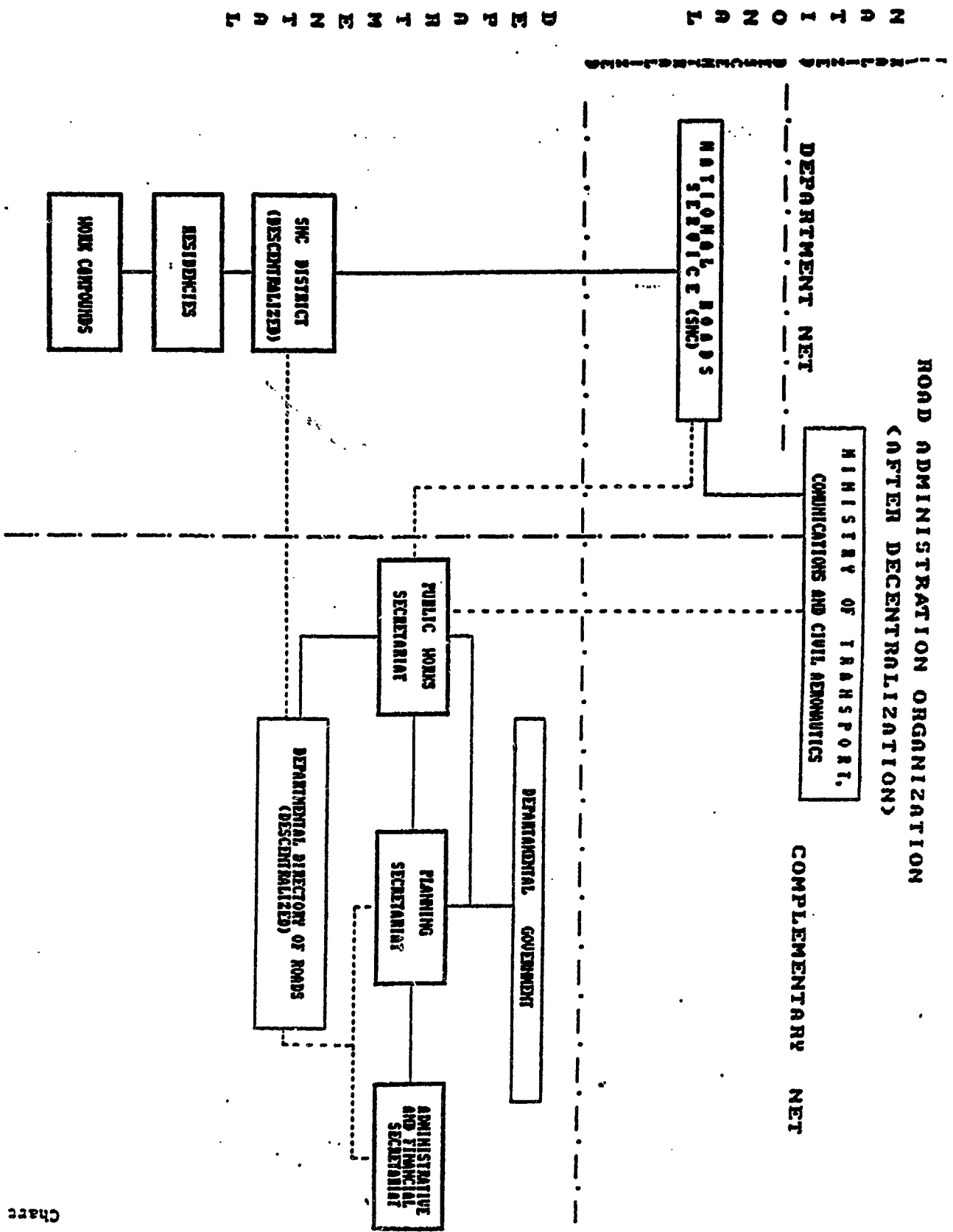


ORGANIZATION OF THE NATIONAL HIGHWAY SERVICE



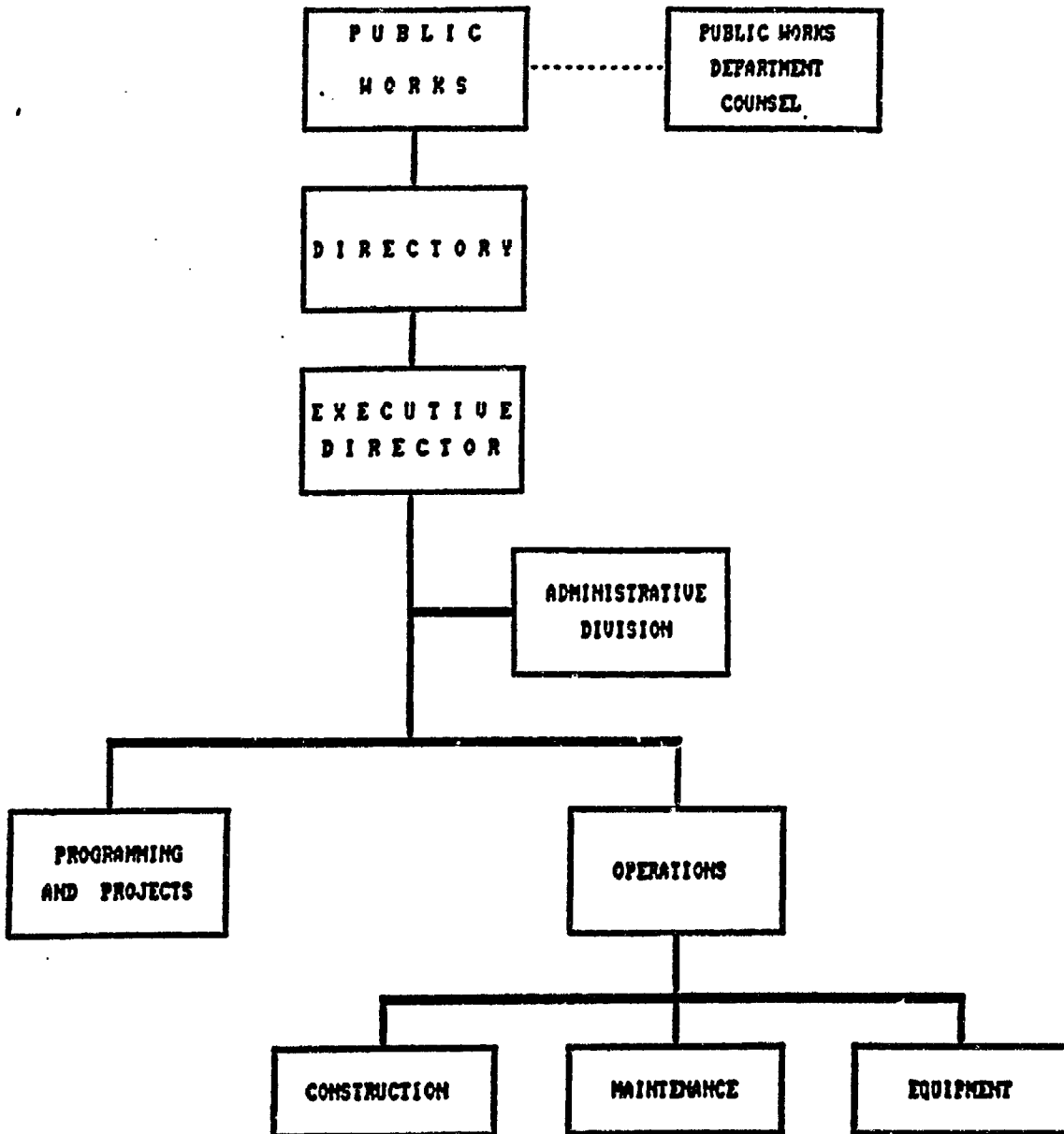


**ROAD ADMINISTRATION ORGANIZATION
(AFTER DECENTRALIZATION)**



NATIONAL DEPARTMENTAL COMPLEMENTARY

**BASIC ORGANIZATION OF THE
DEPARTMENTAL DIRECTORATE OF ROADS**



**BOLIVIA
SECOND ROAD MAINTENANCE PROJECT**

Project Implementation Schedule (1992-1995)

Project Activities (quarters)	1992				1993				1994				1995				1996	
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd
A. Periodic Maintenance by Contract (Paved Network)																		
1) IDA																		
(i) Works																		
(ii) Supervision																		
1) IDB																		
(i) Works																		
(ii) Engineering																		
(iii) Supervision																		
B. Periodic Maintenance by Contract (Gravel Network)																		
1) IDA																		
(i) Works																		
(ii) Supervision																		
1) IDB																		
(i) Works																		
(ii) Engineering																		
(iii) Supervision																		
C. Maintenance by Force Account																		
D. Bridge Maintenance and Repair																		
E. Work Compound Construction																		
F. Equipment																		
(i) equipment rehabilitation by contract																		
(ii) purchase of weighing scales																		
(iii) purchase of traffic measurement and laboratory equipment																		
(iv) Complementary SMC																		
G. Road Safety																		
(i) road signs and signalisation																		
(ii) safety improvements																		

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT
Project Implementation Schedule (1992-1995)

Project Activities	1992				1993				1994				1995				1996			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1. Institutional Strengthening																				
(i) Implementation of SMT & SMT in DDAs																				
(ii) Road Infrastructure Financing																				
(iii) construction industry study																				
(iv) project execution unit																				
(v) training Courses																				
(vi) training Activities																				

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Transport Administration

Ministry of Transport, Communications and Civil Aeronautics

1. Primary responsibility for planning in the transport sector rests with the Ministry of Transport, Communications and Civil Aeronautics (MTC). However, effective responsibility for determining the sector investment level is vested in the Ministry of Planning and Coordination (MP). It is the MP which recommends to the Congress how the treasury funds, on which all operational Ministries depend, should be allocated. Final responsibility for budget allocation is that of the Congress.
2. The Ministry of Transport, Communications and Civil Aeronautics has responsibility for the management of the transport and communications sector, including all land transport modes and civil aviation, but excluding sea, maritime and river transport that are under the Ministry of Defense. It has responsibility for the management of the principal transport agencies - the national highways agency (SNC), the railway authority (ENFE), the national airports authority (AASANA), the national airline in which the state has a majority interest (LAB), the national telecommunications company (ENTEL) and the post company.
3. Until recently, the Ministry had three sub-secretariats, one for planning, one for transport and one for communications. A fourth sub-secretariat was added when the MTC assumed responsibility for civil aviation, but in line with government policy for reducing the size of the public sector, the Subsecretariat of Planning was eliminated and its responsibilities distributed among the remaining three subsecretariats. There is now a director of planning within the Subsecretariat of Transport, with responsibility for control of projects and planning in the transport sector.
4. The organizational diagram of the Ministry (see Chart I) indicates an over bureaucratized structure, with more administrative than operational general directors. The Ministry lacks qualified and experienced professional staff and is unlikely to remedy this deficiency unless the salaries are more competitive with the private sector. The current Economic Management Strengthening Operation (EMSO), in which 600 public service positions will receive salary supplements, does not include the MTC, so the position of its salaries relative to other ministries will deteriorate rather than improve.
5. As the role of the public sector is changing in Bolivia, with a marked reduction in state intervention in activities in which commercial interests, so the role of MTC will also change. The state enterprises whose activities are presently managed by the MTC are being given more operational and financial responsibility, as evidenced by the implementation of operating agreements (Acuerdo Programas) with many of them. These agreements specify

the respective managerial and financial responsibilities of the Ministry and the companies, and provide targets for the company's financial performance. A similar agreement is scheduled to be made later this year with SNC. A further move towards even less state intervention will come with privatization. A start is being made with the Government proposing to sell all or part of its majority ownership in LAB.

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Road Investment Plan

The Six Year Investment Plan

1. The Investment Plan (1992 to 1996) agreed with the Government propose the following expenditure:

	Studies US\$000	New Construction US\$000	Bridges US\$000	Mainte- nance US\$000	Rural Roads US\$000	Total US\$m
1992	2,530	44,999	707	52,832	14,060	115,182
1993	5,230	125,753	2,000	93,065	3,625	229,673
1994	3,420	121,035	2,000	66,875	3,625	196,955
1995	1,850	130,673	2,000	5,000	3,625	143,887
1996	1,250	137,012	2,000	0	7,625	147,887
Total	14,280	559,470	8,707	217,772	32,560	832,791

2. A very high proportion of the Plan is expected to be financed by international institutional and bilateral loans. The expected financing structure of the Plan is shown in the following Table. TGN signifies direct treasury funding and FFAL signifies funding from a special IDB fund, whose operations are described in detail in paragraphs 6 to 8:

	Foreign US\$m	-----National-----		Total US\$m	Foreign %
		TGN US\$m	FFAL US\$m		
Studies	9.86	4.22	0.20	14.28	69.0
New const. A	418.00	73.30	68.17	559.47	74.7
Bridges	0	8.70	0	8.70	0
Maintenance	161.44	3.50	52.83	217.77	74.1
Rural roads	14.76	17.80	0	32.56	45.3
Total	604.06	107.53	121.20	832.79	72.5

3. The Plan is based on a list of all planned projects, prepared by MTC. The phasing of the proposed projects has been determined so that the funding requirements are compatible with projections of what is likely to be available over the next five years. The Investment Plan will be revised annually, to take account of progress in the implementation of current projects and changes in the macro-economic environment that could influence the investment finance available for highways.

4. The constraints taken into account in determining the phasing of projects are:

i) that future debt obligations arising from foreign funding of projects should not exceed the amounts which the Ministry of Planning considers desirable

ii) that the requirement for local counterpart funds should not exceed the amounts which the Ministry of Planning expected to be available during the period of the Plan

iii) that the planning and management capacity required to supervise the projects in the Plan should not exceed SNC's management capacity, and

iv) that the Plan should include all projects already in execution and all projects for which funding has already been committed,

5. It was assumed that the capacity of the national construction would not be a constraint. If the capacity of the national construction industry were to be insufficient to construct the planned projects, additional capacity would be available from neighboring countries. Brazilian companies in particular have made an important contribution to the national construction capacity in the past and are likely to have sufficient excess capacity to repeat the contribution during the next five years, should it be needed.

Counterpart funds

6. There are two sources of finance for counterpart funds, - current revenues of the national treasury and the FFAL (Fondo Fiducial de Aportes Locales). The latter is a fund generated from IDB projects where there is a difference between the interest rate and amortization period of loans from the IDB to the Government and the terms of lending loans to borrowing institutions. The difference between the repayments of the two sets of loans forms a fund, from which soft term loans (15 years amortization, including a five years grace period and five per cent interest) can be used to finance the counterpart component of IDB loans.

7. The SNC has been and is expected to be the principal user of this facility. Deposits in FFAL have amounted to more than US\$107 million, of which about US\$57 million is outstanding in loans for counterpart funding of IDB projects. By the end of the Plan period, the FFAL is expected to receive further receipts, to provide a total of available funds of about US\$235 million, whereas committed future loan allocations, apart from projects included in the proposed Plan, amount to less than US\$1 million. The availability of this fund for IDB projects greatly reduces the impact of counterpart funding requirements on the treasury's current account resources during the implementation period of a loan, since only the amortization costs of the loans from FFAL need to be funded, not the full amount of the counterpart portion of the project costs. In the long term, the net present value of the financing cost of the counterpart funding will be little changed if the interest rate charged on FFAL loans is similar to the rate available on government deposits, since the balance of the FFAL is considered to be part of the national reserves. By similar reasoning, use of the

FFAL funds to finance road infrastructure projects will reduce the level of the national financial reserves from which they are taken. However, the amounts are not sufficient to cause problems.

8. The following table shows the projected amortization costs (in US\$ millions) of FFAL loans to SNC, and the costs of direct treasury funding of the counterpart portion of non IDB projects included in the proposed Plan. The IDB has not yet agreed to finance all of the projects assigned to it in the Plan. Should they decide not to finance any particular project or projects, the counterpart funding from the treasury will need to increase the full amount of the counterpart funding of these project or projects. Although the annual investment cost of the proposed Plan reaches a maximum of three times the 1991 budgeted investment cost, the call on treasury funds for counterpart funding reaches a maximum 12% above the 1991 level. The Plan is now being reviewed by the ministries of Planning and Finance to see if this level of funding is feasible.

Year	1991 US\$m	1992 US\$m	1993 US\$m	1994 US\$m	1995 US\$m	1996 US\$m	Total US\$m
FFAL	1	29	30	26	20	16	122
Treasury	16	17	14	4	3	4	58
Total	17	46	44	30	23	20	180

Foreign debt obligations

9. With few exceptions, the whole road construction program is financed with foreign aid or grants. This allows Bolivia to undertake many infrastructure projects which would otherwise be impossible because of the lack of finance. In many cases, such as loans from IDA, Bolivia foreign funding generally involves long amortization periods, low interest rates and long grace periods.

10. Less than 5% by value of projects are financed entirely from national sources. The principal source of finance in the past has been IDB. Although the dominance of this source is projected to continue in the future, it will be less marked than in the past. It is expected that IDB might provide up to 58% of the foreign funding, Spain 20%, FONPLATA 9%, IDA 7%, Japan 4% and various other sources making up the remaining 2%. All sources other than FONPLATA provide soft loan terms, but is also unlikely that more than 20% of IDB's funding will be on soft terms. The following table shows the expected foreign investment required during the five-year implementation period of the Investment Plan.

Year	1991 US\$m	1992 US\$m	1993 US\$m	1994 US\$m	1995 US\$m	1996 US\$m	Total US\$m
Plan	46	63	172	147	107	113	604

11. The principal debt obligation constraint will not occur in the next five years, as the majority of finance from international and bilateral sources is available to Bolivia on concessionary terms, which provide for an initial grace period, approximately equivalent to the project construction period, with lower interest rates and no capital repayments. The principal constraint comes some five years after the start of a new investment cycle, when capital repayments and full interest payments start. The Investment Plan provides for the next peak of loan repayments to approximately coincide with the termination of loans from the peak of an earlier investment cycle (that of the late 1960's).

12. The next table shows the projected debt repayments, interest and capital, (in US\$ millions) of current loans for road projects and the projected schedule of debt repayments for loans implicit in the Investment Plan.

Year	Current Loans US\$m	Planned New loans US\$m	Total obligations US\$m
1990	32	0	32
1991	43	0	43
1992	43	6	49
1993	50	8	58
1994	57	8	65
1995	52	8	60
1996	51	11	62
1997	48	11	59
1998	45	17	62
1999	45	17	62
2000	45	18	63
2001	45	46	91
2002	42	49	91
2003	36	52	88
2004	34	53	87

13. The repayment requirements in 1991 for current loans (which have a total value of more than US\$650 million) amount to about US\$43 million, and will peak at about US\$57 million in 1994 before beginning to decline as some of the earlier loans are completely amortized. The repayment schedule for the Plan will require US\$17 million in 1998 and 1999, then increase quickly to US\$53 million by 2004. The total debt obligation in respect of highways projects will peak at US\$91 million in 2001 and 2002.

14. The total treasury obligation is made up of the counterpart funding requirements and the foreign debt obligation, including that still outstanding from previous loans. The total obligation during the next five years is shown in the following Table. The peak requirement in 1994 will be US\$89 million. The increased capital financing requirement to the roads sector will be offset by the funding of all current maintenance costs from user charges.

Year	Counterpart funding US\$m	Foreign Debt Repayments US\$m	Total US\$m
1992	22	49	71
1993	27	58	85
1994	24	65	89
1995	15	60	75
1996	19	62	81
Total	107	294	401

15. The total debt obligation will be a significant but manageable burden to the TGN. Its impact in the year 2002, measured in terms of a percentage of GDP, will be reduced to about its 1992 level when GDP increases of 4% per year and inflation also of 4% per year are taken into account.

Supervision capacity of SNC

16. SNC is currently supervising a program of about 17 projects with a total investment value of less than US\$150 million, whereas the Plan will involve a peak of about 24 projects with a total value of about US\$ 420million. The supervision capacity required to manage an investment plan is more closely related to the number of contracts which must be managed at any time, and so is also related to the total value of the plan, more than to the number of projects. If the average value of each contract remains at or about the current level, the managerial capacity of SNC will need to increase by more than 250%.

17. SNC will provide a revised structure and staffing proposal which takes account of the projected work load in respect of supervision of the Investment Plan. Under the Export Corridors Project, MTC has requested funds for the implementation of an information system to help in the management of all investment projects in the transport sector. The largest part of this information system will be devoted to management and supervision of the road investment plan. This system will be compatible with the requirements of the Ministry of Planning and will help to integrate the physical (MTC) and financial (MP) aspects of project supervision.

18. The implementation of these information systems will greatly increase the capacity of SNC in respect of project supervision, but will require a change in the staffing structure, with more qualified engineers and fewer unqualified administrative personnel. These changes will be reflected in the revised staffing structure to be provided by SNC. The change to a computerized project information system and the implementation of a staffing structure which takes explicit account of the magnitude of the supervision task, will provide supervision capacity compatible with the management task implicit in the Investment Plan.

Content of the Investment Plan

19. The Plan will require a total investment of US\$833 million over the five year period. The annual average investment will be US\$167 million, with a maximum of US\$230 million in 1993, compared with an budgeted investment of US\$63 million in 1991. The following table shows the total annual investment indicated in Plan:

Year	1992	1993	1994	1995	1996	Total
	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
Plan	115	230	197	143	148	833

Although the Plan will require a large increase in total investment, only a small proportion of the total investment cost represents an immediate call on treasury funds. Treasury funding will be required for two purposes, to provide the counterpart requirements and to service the overseas debt. Most of the increase in 1992, 1993 and 1994 is for already committed projects.

20. The structure of the plan is less concentrated on new construction (67.1) than in most countries at a similar stage of the Bolivian development. This is reflection of the inclusion of two large maintenance projects, the reconstruction of the access roads to the new Santa Cruz to Cochabamba highway and this Project. Once the projects are completed, necessary capital expenditure on reconstruction will reduce to a minimum and be replaced by adequate current expenditure on routine maintenance.

21. Less than 2% of the total cost is allocated to studies, including feasibility studies. This partially reflects previous expenditure on feasibility studies for projects which could not so far be financed, but could also indicate a need to increase expenditure on this item towards the end of the Plan period.

22. Total planned investment on rehabilitation and reconstruction is US\$218 million, an average of US\$43 million per year but with a concentration in 1992 and 1993 with expenditures of US\$93 million and US\$67 million respectively. This peak is a consequence of the coincidence of peak expenditure on the two major maintenance projects. These two projects will result in the complete reconstruction of the paved network and for all justifiable reconstructions of the gravel road network. Once they are completed, the need for capital expenditure on maintenance will reduce until the next cycle of periodic maintenance. This reduced need is reflected in the low level, less than US\$5 million, of investment maintenance expenditure scheduled for 1995 and 1996.

23. Most bridge reconstruction is included in the specification of sub projects forming part of this Project. A further small expenditure, less than 1% of the total, is included in the Plan for reconstruction of bridges on links not included in the Project. Rural roads expenditure depends to a large extent on bilateral financing, especially from the United States and Japan. These projects amount to 4% of the total proposed investment. The considerable investment in equipment for rural road construction is financed exclusively by foreign grants and does not feature in this Investment Plan.

24. Tables 1 and 2 provide details of all the projects included in the Plan. The Table is divided into six parts. Table 1 provides a summary of the information found in Table 2. It shows the allocation of funds between the different types of project and indicates the distribution of costs by year and by financing source. Tables 2(i) through 2 (ix) show: i) the effect of including the full cost of the FFAL funds instead of just the interest charges; ii) a summary of the total counterpart funds needed for each already committed project; iii) new studies; iv) and v) currently committed projects; vi) as yet uncommitted new construction projects; vii) specific bridge projects; viii) maintenance projects, and: ix) rural road projects. Table 3 shows the FFAL interest charges for projects which IDB have already agreed to finance.

Summary

25. The Investment Plan provides a feasible basis for future road development in Bolivia. Sufficient funds are allocated to periodic maintenance and the proposed increase in routine maintenance should avoid the need for unscheduled early reconstruction of the roads whose reconstruction is included in the Plan. All of the current commitments for foreign funding are included in the Plan, but some of them are deferred to later than originally envisaged because of the lack of counterpart funds and the limits to SNC's project management capacity. By the end of the Plan period, the paved network will have increased by more than 750 km, or by more than 40%. The counterpart funding requirement is within the treasury's capacity and the long term debt liability of the roads sector will have reverted to its 1992 level by 2004.

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Table 1

ROAD INVESTMENT PLAN, 1992 TO 1996

SUMMARY

a) By project type and funding source	1992/96		1992/96		1992/96		Percentage by project type %
	Local TGN US\$ '000	Local FPAL US\$ '000	Local Total US\$ '000	Foreign US\$ '000	Total US\$ '000	Total US\$ '000	
a) Studies	4,220	10	4,230	9,860	14,090		2.0%
b) New Construction	73,301	3,409	76,710	418,001	494,711		68.9%
c) Bridges	8,707	0	8,707	0	8,707		1.2%
d) Maintenance	3,500	2,642	6,142	161,440	167,582		23.4%
e) Rural Roads	17,800	0	17,800	14,750	32,550		4.5%
Total	107,528	6,060	113,588	604,061	717,649		100.0%

b) By project type and year	1	2	3	4	5	Total
	US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000
a) Studies	2,483	3,088	3,420	1,850	1,250	14,090
b) New Construction	33,787	114,662	109,926	114,548	121,788	494,711
c) Bridges	707	2,000	2,000	2,000	2,000	8,707
d) Maintenance	36,367	73,965	33,480	1,770	0	167,582
e) Rural Roads	14,060	3,625	3,625	3,625	7,625	32,560
Total	87,403	201,339	172,431	123,793	132,663	717,649

c) By funding source and year	1	2	3	4	5	Total
	US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000
Local funds - TGN	22,359	27,436	23,636	15,424	18,633	107,528
Local funds - FPAL	1,439	1,491	1,290	1,019	801	6,060
Sub total local	23,818	28,927	24,946	16,443	19,434	113,588
Foreign	63,585	172,412	147,505	107,350	113,209	604,061
Total	87,403	201,339	172,431	123,793	132,663	717,649

Notes:

FPAL indicates the Fondo Fiducial de Aportes Locales

TGN signifies the National Treasury (Tesoro General de la Nacion)

ROAD INVESTMENT PLAN, 1992 TO 1996

SUMMARY

Table 2 (1)

INCLUDING FULL COST OF FFAL FUNDS (excluding interest charge)

By project type funding source	1992/96	1992/96	1992/96	1992/96	1992/96
	Local TGN	Local FFAL	Local Total	Foreign	Total
Studies	4,220	200	4,420	9,860	14,280
New Construction	73,301	68,170	141,471	418,001	559,472
Bridges	8,707	0	8,707	0	8,707
Maintenance	3,500	52,832	56,332	161,440	217,772
Rural Roads	17,800	0	17,800	14,760	32,560
Total	107,528	121,202	228,730	604,061	832,791

By project type year	1992	1993	1994	1995	1996	Total
Studies	2,330	5,230	3,420	1,850	1,250	14,280
New Construction	44,999	125,753	121,035	130,673	137,012	559,472
Bridges	707	2,000	2,000	2,000	2,000	8,707
Maintenance	52,832	93,063	66,873	5,000	0	217,772
Rural Roads	14,060	3,623	3,623	3,623	7,623	32,560
Total	115,128	229,673	196,953	143,148	147,887	832,791

By funding source year	1992	1993	1994	1995	1996	Total
Local funds - TGN	22,359	27,436	23,636	13,424	18,653	107,528
Local funds - FFAL	29,184	29,823	25,794	20,374	16,823	121,202
Sub total local	51,543	57,259	49,430	33,798	34,678	228,730
Foreign	63,585	172,412	147,523	107,350	113,209	604,061
Total	115,128	229,673	196,953	143,148	147,887	832,791

PROPOSED HIGHWAY INVESTMENT PROGRAM - COMMITTED PROJECTS - counterpart funds (US\$ thousand)

Table 2 (11)

				1991	1992	1993	1994	1995	1996	Total
a) Design										
Sucre	Ipaci	BID	Local	100						100
Santa Barbara	Bella Vista	JICA	Local							0
Preinvestment Appraisal		BID	Local		200					200
Cuchu Ingento	Villazon	FONPLATA	Local		200	300				500
Institutional Strengthening		BID	Local	150						150
Sub total				230	400	300	0	0	0	930
b) Construction										
Quicuibey	Yacumo	BID	Local	5,300						5,300
Santa Cruz	Trinidad	FONPLATA	Local	4,700	6,000	6,112				16,812
Confital	Caihuasi	BID	Local	6,200	8,000	7,950				22,150
Totacoa	Puente Mendez	FONPLATA	Local	1,700	670					2,370
Palmar Grande	Yacuiba	FONPLATA	Local	1,500	3,300	3,572				8,372
Patacamaya	Tambo Quemado	BID/JAPAN	Local		1,500	1,400	1,400	700		5,000
Potosi	Puente Mendez	ESPAÑA	Local	500	600	600	300			2,200
Dasenboque	Bernjo	FIBAD	Local							
Camiri	Palmar Grande	FIBAD	Local							
Tomatitas	San Lorenzo	Foreign	Local	500						500
S. Buenaventura	Tumupasa	Foreign	Local	1,410						1,410
Cotapata	Sta. Barbara	BID	Local			7,000	7,000	7,000	3,520	24,520
Sub total				22,010	20,270	26,634	8,900	7,700	3,520	89,034
c) and d) Bridges and Maintenance										
Program PL 480		USAID	Local	2,182	2,000	2,000	2,000	2,000	2,000	12,182
Semaipata	Taruma	BID	Local	145						145
Southern Districts		CAF	Local	700						700
El Alto	Oruro	IDA	Local	700						700
Chimore	Yapacani	BID/CAF/FPL	Local	5,000	11,368	11,367				27,735
National Maintenance Program		IDA/IDB	Local		4,800	4,800	4,800	4,600		19,000
Chuquisaca Roads			Local	300						300
Sub total				9,027	18,168	18,167	6,800	6,600	2,000	60,762
e) Caminos Vecinales										
Rural Roads Phase II			Local	300	338					638
Santa Cruz			Local							0
Northern Chuquisaca			Local	150						150
Yungas La Paz			Local	200						200
Sub total				650	338	0	0	0	0	988
f) Resumen										
Estudios				230	400	300	0	0	0	930
Nuevas construcciones				22,010	20,270	26,634	8,900	7,700	3,520	0
Puentes				2,182	2,000	2,000	2,000	2,000	2,000	12,182
Mantenimiento				6,845	16,168	16,167	4,800	4,600	0	48,580
Camminos vecinales				650	338	0	0	0	0	988
Total				31,937	39,176	45,101	15,700	14,300	3,520	62,700

ROAD INVESTMENT PLAN, 1991 TO 1996

ESTUDIOS

Table 2 (111)

Project	Length	Funding Source	Total	1991	1992	1993	1994	1995	1996	1991/96	
Oruro	Fisigla	225	EXTERNO	0						0	
			Local	1,300		700	800			1,300	
			Total	1,300		700	800			1,300	
Santa Barbara	Bella Vista	116	JICA	1,300		300	1,200			1,300	
			Local	0						0	
			Total	1,300	0	300	1,200			1,300	
Preinvestment Appraisal	366		BID	1,360			1,360			1,360	
			Local	150			150			150	
			Total	1,310		0	1,310			1,310	
Pacaya	La Maura	40	FONPLATA	210		210				210	
			Local	70		70				70	
			Total	280		280				280	
Madidi	Chiva	162	EXTERNO	960				960		960	
			Local	240				240		240	
			Total	1,200				1,200		1,200	
Cuchu Ingenio	Villasoa	323	FONPLATA	2,100		900	600	600		2,100	
			Local	1,000		200	400	400		1,000	
			Total	3,100		1,100	1,000	1,000		3,100	
Riberalta	Guayaramerin	88	EXTERNO	400				400		400	
			Local	100				100		100	
			Total	500				500		500	
Panamericana	Villamontes	240	EXTERNO	1,000		300	300			1,000	
			Local	440			220	220		440	
			Total	1,440			720	720		1,440	
Villa Tunari	San Ignacio	294	EXTERNO	880				880		880	
			Local	220				220		220	
			Total	1,100				1,100		1,100	
Potosi	Tarija	360	EXTERNO	1,000				300	300	1,000	
			Local	300				250	250	300	
			Total	1,300				750	750	1,300	
Bella Vista	Quiquibay	93	EXTERNO	350					350	350	
			Local	150					150	150	
			Total	500					500	500	
Institutional Strengthening			BID	100		100				100	
			Local	50		50				50	
			Total	150		150				150	
			Foreign	9,860	0	1,310	3,660	2,460	1,380	850	9,860
			TGN Local	4,220	0	970	1,420	960	470	400	4,220
			FFAL Interest	10	0	3	8	0	0	0	10
			FFAL Full	200	0	30	150	0	0	0	200
			Local (FFAL Interest)	4,220	0	973	1,420	960	470	400	4,220
			Local (FFAL Full)	4,420	0	1,020	1,370	960	470	400	4,420
			Total (FFAL Interest)	14,090	0	2,483	3,088	3,420	1,830	1,250	14,090
			Total (FFAL Full)	14,290	0	2,513	3,230	3,420	1,830	1,250	14,290
Rate	2,327		Total (FFAL Interest)	14,090	0	2,483	3,088	3,420	1,830	1,250	14,090
Cost per km	3,651		Total (FFAL Full)	14,290	0	2,513	3,230	3,420	1,830	1,250	14,290

ROAD INVESTMENT PLAN, 1991 TO 1996

NUEVOS CONSTRUCCIONES (B)

Table 2 (v)

Origin	Destination	Length	Funding Source	Total	1991	1992	1993	1994	1995	1996	1991/96	
Padcaya	La Hamora	40	FORPLATA	27,160			3,432	3,432	3,432	3,432	15,728	
			Local	6,790			1,358	1,358	1,358	1,358	5,432	
	12 Cost per km	648,750	Total	33,950			4,790	4,790	4,790	6,790	21,160	
San Norja	Trinidad	228	BID	71,700					5,000	8,800	13,800	
			Local	17,930					1,030	2,000	3,030	
	14 Cost per km	393,114	Total	89,630					6,030	10,800	16,830	
Challapata	Tarapaya	168	BID	84,910					5300	10300	16,000	
			Local	21,230					1100	2200	3,300	
	13	631,786	Total	106,140					6,600	12,700	19,300	
Rio Azero	Monteagudo	32	BID	54,080				4600	6000	12000	22,600	
			Local	13,520				1350	2000	2200	3,550	
	19 Cost per km	1,300,000	Total	67,600				5,750	8,000	14,200	27,950	
Pailion	P.Suarez	180	BID	238,000				8,000	10000	12000	30,000	
			Local	88,000				1,000	2300	2300	6,000	
	20 Cost per km	1,811,111	Total	326,000				9,000	12,300	14,300	36,000	
Rio Seco	Desaguadero	96	BID	26,300			4400	4100	4,100	4,300	17,100	
			Local	3,100			300	1000	1,000	1,000	3,500	
	16 Cost per km	327,083	Total	31,400			4,900	5,100	5,100	5,300	20,600	
Concepcion	San Ignacio	130	Alemania	200		200					200	
			Local	580		580						580
	21 Cost per km	5,200	Total	780		780					780	
Cobija y puentes	Chive	181	ITALIA	18,000			8800	3,400	3,400	2,400	18,000	
			Local	2,500			230	750	750	750	2,500	
	17 Cost per km	113,260	Total	20,500			9,030	4,150	4,150	3,150	20,500	
Potosi	Tomatae	181	ESPAÑA	205,000						10,000	10,000	
			Local	0								0
	18 Cost per km	1,132,597	Total	205,000						10,000	10,000	
				Foreign	1,149,380	0	20,315	93,362	90,643	102,745	110,734	418,001
				Local TGN	132,229	0	12,882	20,316	18,696	10,934	10,253	73,301
				FFAL interes	11,093	0	590	583	583	849	801	3,409
				FFAL full	221,850	0	11,802	11,675	11,694	16,974	16,025	68,170
				Local (FFAL interes)	143,322	0	13,472	21,100	19,281	11,803	11,054	76,710
				Local (FFAL full)	354,079	0	24,684	32,191	30,390	27,928	26,278	141,471
Km	ERR Total (FFAL interes)			1,292,902	0	33,787	114,662	109,926	114,568	121,788	494,711	
Cost per km	ERR Total (FFAL full)			1,503,659	0	44,999	125,753	121,635	130,673	137,012	559,472	

ANNEX 2

ROAD INVESTMENT PLAN, 1991 TO 1996

PUENTES

Table 2 (viii)

d) Bridges	Origin	Destination	Length	Funding Source	Total	1991	1992	1993	1994	1995	1996	1991/96
Program PL 480				USAID	18,300							
				Local	9,920		707	2,000	2,000	2,000	2,000	8,707
				Total	28,420		707	2,000	2,000	2,000	2,000	8,707
Sub total				Foreign	18,300	0	0	0	0	0	0	0
				Local TGN	9,920	0	707	2,000	2,000	2,000	2,000	8,707
				FPAL interes	0	0	0	0	0	0	0	0
				FPAL full	0	0	0	0	0	0	0	0
				Local (FPAL interest)	9,920	0	707	2,000	2,000	2,000	2,000	8,707
				Local (FPAL full)	9,920	0	707	2,000	2,000	2,000	2,000	8,707
				Total (FPAL interest)	28,420	0	707	2,000	2,000	2,000	2,000	8,707
				Total (FPAL full)	28,420	0	707	2,000	2,000	2,000	2,000	8,707

ROAD INVESTMENT PLAN, 1991 TO 1996

MANTENIMIENTO

Table 2 (viii)

d) Maintenance	Origin	Destination	Length	Funding Source	Total	1991	1992	1993	1994	1995	1996	1991/96
Samaipata	Taruma		80	BID	8,618							0
				Local	1,132		1,132					1,132
				Total	9,750		1,132					1,132
El Alto	Oruro		240	IDA	14,900		1,700	5,890				7,390
Resurfacing				Local	3,300		2,000	1,500				3,500
				Total	18,300		3,700	7,390				11,090
Chimore	Yapecani		258	BID/CAF/FPAL	97,000		2,300	35,675	35,575			73,850
				Local	28,400		7,200	8,000	8,000			23,200
				Total	125,400		9,700	43,675	43,675			97,050
National Maintenance Program			1645	IDA/IDB	80,000		29,300	32,000	17,100	1,600	0	80,000
				Local	28,300		9,000	10,000	6,100	3,400	0	28,300
				Total	108,300		38,300	42,000	23,200	5,000	0	108,300
				Foreign	200,418	0	33,500	73,563	52,775	1,600	0	161,440
				Local TGN	3,300	0	2,000	1,500	0	0	0	3,500
				FPAL interes	2,902	0	867	900	705	170	0	2,642
				FPAL full	58,032	0	17,332	18,000	14,100	3,400	0	52,832
				Local (FPAL interest)	6,402	0	2,867	2,400	705	170	0	6,142
				Local (FPAL full)	61,332	0	19,332	19,500	14,100	3,400	0	56,332
Kms				ERR Total (FPAL interest)	206,820	0	36,367	75,963	53,480	1,770	0	167,582
Cost per km				ERR Total (FPAL full)	261,950	0	52,832	93,065	66,875	5,000	0	217,772

ROAD INVESTMENT PLAN, 1991 TO 1996

CAMINOS VECINALES y RESUMEN

Table 2 (ix)

Project Origin	Destination	Length	Funding Source	Total	1991	1992	1993	1994	1995	1996	1991/96
Rural Roads Phase II		314	USAID	6,810		360					360
			Local	1,720		300					300
			Total	8,530		660					660
La Paz			JICA	5,900		5,900					5,900
			Local	2,200		2,200					2,200
			Total	8,100		8,100					8,100
Potosí			JICA	4,100		600	875	875	875	875	4,100
			Local	6,300		2,300	1,000	1,000	1,000	1,000	6,300
			Total	10,400		2,900	1,875	1,875	1,875	1,875	10,400
Chuquisaca			JICA	3,700		700	750	750	750	750	3,700
			Local	4,400		400	1,000	1,000	1,000	1,000	4,400
			Total	8,100		1,100	1,750	1,750	1,750	1,750	8,100
Tarija			JICA	700		700					700
			Local	400		400					400
			Total	1,100		1,100					1,100
Nacional			Local	45,000						4,000	4,000
			Total	45,000						4,000	4,000
Sub total			Foreign	21,210	0	8,260	1,625	1,625	1,625	1,625	14,760
			Local TGN	60,020	0	5,800	2,000	2,000	2,000	6,000	17,800
			FFAL interes	0	0	0	0	0	0	0	0
			FFAL full	0	0	0	0	0	0	0	0
			Local (FFAL interest)	60,020	0	5,800	2,000	2,000	2,000	6,000	17,800
			Local (FFAL full)	60,020	0	5,800	2,000	2,000	2,000	6,000	17,800
			Total (FFAL interest)	81,230	0	14,060	3,625	3,625	3,625	7,625	32,560
Total (FFAL full)	81,230	0	14,060	3,625	3,625	3,625	7,625	32,560			
Resumen											
TOTAL			Foreign	1,399,568	0	63,583	172,412	147,505	107,350	113,209	604,061
			Local TGN	209,889	0	22,359	27,436	23,656	15,424	18,653	107,328
			FFAL interes	14,004	0	1,459	1,491	1,290	1,019	801	6,060
			FFAL full	280,082	0	29,184	29,825	25,794	20,374	16,025	121,202
			Local (FFAL interest)	223,893	0	23,818	28,927	24,946	16,443	19,454	113,588
			Local (FFAL full)	489,971	0	51,543	57,261	49,450	35,798	34,678	228,730
			Total (FFAL interest)	1,623,461	0	87,403	201,339	172,451	123,793	132,663	717,649
Total (FFAL full)	1,889,539	0	115,128	229,673	196,955	143,148	147,887	832,791			

ANNEX 2

INTEREST PAYMENTS TO FFAL

Table 3

Project Region	Destination	Length	Funding Source	Total	1992	1993	1994	1995	1996	1991/96
				US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000	US\$ '000
reinvestment	Appraisal	386	BID	8	0	8	0	0	0	8
stitutional	Strengthening	0	BID	3	3	0	0	0	0	3
uibe	Yacumo	42	BID		217	0	0	0	0	217
uffital	Cadhuasi	50	BID		298	398	161	161	0	1,018
atcamaya	Tambo Quemado	192	BID		50	74	74	74	74	347
otapata	Sta. Barbara	49	BID		0	50	145	195	195	585
an Borja	Trinidad	228	BID	891	0	0	0	52	100	152
hallapata	Tarapaya	168	BID	1,062	0	0	0	53	110	165
Aserc	Monteagudo	52	BID	676	0	0	48	100	110	278
illon	F.Suarez	180	BID	4,400	0	0	50	125	125	300
o Seco	Desaguadero	96	BID	233	0	25	50	50	50	175
ipata	Taruma	80	BID	57	57	0	0	0	0	57
imore	Yapacani	258	BID		311	346	346	0	0	1,004
ational	Maintenance Program	1643	BID		225	250	133	85	0	713
Sub total		3326		7,356	1,161	1,150	1,046	897	764	5,018

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Road Maintenance By Force Account

Maintenance Organization

1. Maintenance of the road network is carried out by SNC's Maintenance Department (MD), reporting to the Operations Division, with three units at the central level: one for planning and control, another for pavement technology and the third for personnel training. A new unit, the Project Execution Unit (Unidad Ejecutora del Proyecto - UEP) was created in 1989 to coordinate the actions in projects with external financing. SNC's organization in the field on road maintenance is composed by ten districts, each employing from 520 people (La Paz) to 82 people (Pando), depending directly on the Operations Division. The districts are further divided into 43 subdistricts and five special units. Road maintenance equipment and workshops are supervised and coordinated by the Equipment Department (ED), also depending on the Operations Division, and composed of five units: Supervision, Procurement, Central Work Compound, Workshops and El Alto Unit. All this organization totals about 3,857 people of which 236 are at the central office and the rest work in the districts. These numbers ought to be sufficient to carry out the required maintenance work by force account and to plan and control the entire maintenance program. On the other hand, maintenance equipment still needs rehabilitation and major repairs (see Annex 4).

Maintenance Planning and Budgeting

2. Maintenance planning has not been practiced before 1990. Traditionally, the data for budget preparation had been generated in SNC, with very little quantitative input from the field operating units. The budget format was very general and was not based on any measure of expected work performance. Each year the budget submission represented a percentage increase over the previous year, but with little assessment of what funds are really required for each maintenance function.

3. In recent years, the Government and SNC have made efforts to allocate funds to improve road maintenance. The corresponding allocations under the current account increased from US\$5.6 million in 1985 to US\$18 million in 1988 and US\$20.2 million in 1989, but these budgets were not sufficient and caused maintenance levels to deteriorate significantly and, so far, have not recovered in real terms. The 1990 budget for SNC's current expenses reached US\$29.0 million, (including about US\$6 million for purchases of some units of equipment), of which 97% of the total had been disbursed by December 31, 1990. The level of disbursement varied from 106% for wages to 60% for spare parts to operate the equipment. Considering the total amount disbursed, the average expenditure on road maintenance was about US\$740 per km in 1990. This is adequate for routine maintenance alone, but not enough to cover periodic maintenance and therefore, less than 11,000 km received adequate maintenance.

4. The budget for current expenses in 1991 was about US\$22 million. However, these funds are still barely sufficient. They represent a significant effort, (about 30% of the total road expenditures budget, capital and current) but are still a low amount, especially if we take into account that from the US\$23 million, approximately US\$12 million is for salaries of about 3,857 people who are SNC employees, of which only around 3,170 people are actually working on road maintenance. An additional amount of about US\$8.3 million was included in the SNC investment program for 1991 to carry out the maintenance program financed by CAF in the five southern districts. Furthermore, in recognition of the inadequacy of the funds allocated to road maintenance, the National Treasury (TGN) in the last quarter of the year transferred to SNC additional US\$4.2 million for the maintenance program. These facts and figures confirm the need to prepare adequate maintenance programs and budgets and to establish an appropriate control system.

5. The 1587-BO project provided technical assistance to prepare and develop the SAM, a maintenance management system and the SAE, an equipment management system, and some training was also provided especially for equipment management and workshop organization. However, a detailed work program was never implemented. In 1989, SNC started the implementation of the SAM and the SAE in the five southern districts under CAF (Corporacion Andina de Fomento) financing and recently the SAM and the SAE have been implemented in the other five districts, under the Export Corridors Project. Now, the SAM and the SAE will provide the means to improve the maintenance budget process. In the meantime, the general principals of these systems have been used in the preparation of the annual maintenance budgets by force account for 1991 and 1992-1995.

Road Maintenance Programs (1991-1995) by Force Account

6. During project preparation, the maintenance activities to be carried out by force account and the parameters of the SAM were reviewed and updated for planning purposes and used as inputs for the system in preparing maintenance programs for the period 1991-1995. The first maintenance program studied was the program for 1991, based on the maintenance activities provided by the system; each activity has its work measurement unit (e.g. square meter). The level of maintenance service to be provided was established for what was considered a full level of maintenance service. This "full level" implies all maintenance requirements except marks and signals studied separately, (see Annex 8 and was defined by a set of quantity standards (e.g. square meters of patching per year) with a separate standard for each activity. Quantity standards were fixed starting from the existing system and the results of interviews with SNC's staff at the field level. Three basic levels of quantity standards were determined corresponding to the three categories of roads (fundamental, complementary and rural). Modifying factors to the quantity standards were introduced according to pavement condition, surface type, climatic regions, pavement age and SNC's policies (e.g. manual or mechanical execution). Data on pavement condition were collected in the field using the Mays Meter, the Benkelman Beam, soil testing from core samples and surveys by SNC's staff.

7. Once the maintenance activities and the levels of maintenance (expressed in quantity standards) were established, the Bank's HDM model was used to

analyze different quantity standards for the most important activities (those that represent more than 80% of the maintenance total cost) and select the optimum alternative for a specific road condition. The levels of maintenance were so optimized and used in the SAM to obtain a maintenance program and budget. Another model, the Expenditure Budgeting Model (EBM) was then used, interacting with the HDM model, to select the maintenance policies, and maximizing the investment under the existing budget constraints. These new quantity standards were then used again by the SAM to determine a maintenance program adjusted to the resources available. (Once the quantity standards are established, annual work quantities are determined for each maintenance activity by multiplying the quantity standards by the appropriate inventory quantity. The amounts and types of resources required to carry out the annual work quantities are determined by using each maintenance activity's performance standard, which define the activity, the daily resource requirements, the expected daily accomplishment and the approved work method. Annual costs for each activity are determined by multiplying the resources required by unit costs for labor, equipment and materials. The sum of all annual activity cost is the maintenance budget).

8. The network length considered under maintenance in the 1991 program was 37,128 km corresponding to the length of the total highways network less the part of the network under reconstruction or rehabilitation in 1991. Out of the length considered, only about 20,500 km are properly maintainable according to the criteria established in the SAM. The rest of the network only can be considered for emergencies and essential works to maintain the roads passable. The maintenance program and budget were prepared for each road, district by district, for all roads in which the SAM is applicable (the maintainable network). The program for the rest of the network was evaluated according the experience of SNC's staff in past years. As a sum of all these programs, a general program and budget were prepared for the nation's entire highway network. The total maintenance budget for 1991 resulted in the equivalent to US\$26.8 million of which US\$11.9 million was for activities considered as routine maintenance and US\$5.3 million) for activities considered as periodic maintenance. The rest was for emergencies and improvements. The program for 1991 was considered minimum but satisfactory and was used by SNC to propose the 1991 maintenance budget to the Government. It was also a step forward in improving road maintenance procedures and modifying current maintenance practices and will set up a starting point for developing the maintenance programs for the following years.

9. The program for 1992 was prepared on the same basis that the 1991 program but, including under routine maintenance the part of the network under reconstruction and rehabilitation in 1991 and excluding the part under reconstruction and rehabilitation in 1992. The total maintenance budget for 1992 is the equivalent to US\$35.2 million of which US\$12.9 million for routine maintenance (US\$15.7 million) for periodic maintenance US\$1.2 million is for emergencies and US\$ 4.4 million for minor improvements. The length of the network (total and by district) considered under maintenance by force account is shown in Table 1A. The results of the 1992 program are shown in Table 1B.

10. The programs for 1993, 1994 and 1995 were prepared on the same basis as the 1991 and 1992 programs. They are also based on the assumption of

excluding the part of the network in reconstruction or rehabilitation during the project period. It was estimated that the roads under reconstruction or rehabilitation in the year considered will not need routine nor periodic maintenance in that year, but will need routine maintenance in the following year and periodic maintenance after four years of the reconstruction and rehabilitation works.

11. The length of the network (total and by district) considered under maintenance by force account in 1993-1995 is shown in Tables 2.A (1993); 3.A (1994); and 4.A (1995). The results of the 1993-1995 programs are shown in Tables 2 B (1993); 3 B (1994); and 4 B (1995) with the partial budgets for routine maintenance, periodic maintenance, emergencies and minor improvements, and the total SNC maintenance cost by force account for each year.

12. Table 5 shows a summary of the length and results of Tables A and B. The total amount for maintenance by force account in 1992-1995 is the equivalent to US\$77.5 million, of which US\$54.5 (or 70.3%) is for routine maintenance, US\$18.3 million (or 23.6%) is for periodic maintenance, and US\$4.7 million (or 6.1%) is for emergencies. All these figures, which do not include salaries for the people working at the central offices and other current expenditures of SNC, are considered adequate, taking into account the additional US\$ 60.1 million for periodic maintenance by contract, which will be financed by the Project. Table 5 also includes the figures for periodic maintenance by contract in the paved and gravel network.

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NATIONAL NET MAINTENANCE PROGRAM 1992

DISTRICT	MAIN ROADS				COMPLEMENTARY ROADS				FEEDER ROADS				TOTAL BY DISTRICT			
	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL
D-1 LA PAZ	197	253	38	481	76	238	294	608	48	1,489	2,969	4,418	313	1,893	3,293	5,498
D-2 CHUQUISACA	22	571	166	759		47	211	258		327	3,885	3,332	22	945	3,383	4,349
D-3 TARIJA	64	314	188	486		388	164	472	18	382	1,413	1,886	75	1,884	1,685	2,764
D-4 COCHABAMBA	485	119		524	7	57	131	195	5	911	1,854	1,969	417	1,887	1,185	2,689
D-5 SANTA CRUZ	248	391	13	645		358	499	858	55	966	3,134	4,155	295	1,716	3,647	5,658
D-6 ORURO	153	163		316		396	586	981		422	4,616	5,838	153	981	5,282	6,336
D-7 POTOSI	21	238	7	258		182	319	421		242	4,152	4,394	21	575	4,477	5,873
D-8 TUPIZA						191	283	474		384	2,171	2,555		575	2,454	3,829
D-9 BENI		268	534	794		43	287	338		2	159	161		385	988	1,285
D-10 PANDO		39	139	178			115	115			187	187		39	441	488
TOTAL COUNTRY	1,183	2,348	997	4,448	83	1,733	2,889	4,785	118	5,845	22,868	29,816	1,296	9,118	26,747	37,161

ANNEX 2
Table 1-

ACCOUNT		UNIT COSTS (BY FORCE ACCOUNT)		EQUIPMENT		LABOR		MATERIALS		TOTAL		ANNUAL BUDGET (BY CONTRACT)		TOTAL	
INVENTORY	ANNUAL	INVENTORY	ANNUAL	INVENTORY	ANNUAL	INVENTORY	ANNUAL	INVENTORY	ANNUAL	INVENTORY	ANNUAL	INVENTORY	ANNUAL	INVENTORY	ANNUAL
QUANTITIES	UNIT COST	QUANTITIES	UNIT COST	QUANTITIES	UNIT COST	QUANTITIES	UNIT COST	QUANTITIES	UNIT COST	QUANTITIES	UNIT COST	QUANTITIES	UNIT COST	QUANTITIES	UNIT COST
ANNUAL WORK PROGRAM AND LOGS MAINTENANCE PROGRAM															
SOBRIE MAINTENANCE 1992															
PERIODIC MAINTENANCE 1992															
EMERGENCY ACTIVITIES 1992															
CITY ACTIVITIES															
MAINTENANCE IMPROVEMENT															
TOTAL MAINTENANCE IMPROVEMENT															
TOTAL MAINTENANCE PROGRAM															
TOTAL PERIODIC MAINTENANCE															
TOTAL CITY ACTIVITIES															
TOTAL EMERGENCY ACTIVITIES 1992															
TOTAL MAINTENANCE															
SOBRIE MAINTENANCE 1992															
PERIODIC MAINTENANCE 1992															
EMERGENCY ACTIVITIES 1992															
CITY ACTIVITIES															
MAINTENANCE IMPROVEMENT															
TOTAL MAINTENANCE IMPROVEMENT															
TOTAL MAINTENANCE PROGRAM															

ANNUAL WORK PROGRAM AND LOGS MAINTENANCE PROGRAM

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NATIONAL NET MAINTENANCE PROGRAM 1993

D I S T R I C T	MAIN ROADS				COMPLEMENTARY ROADS				FEEDER ROADS				BY DISTRICT			
	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL
D-1 LA PAZ	191	155	219	565	264	238	294	796	48	1,359	2,959	4,367	494	1,744	3,482	5,720
D-2 CHUQUISACA	53	571	166	791		47	211	258		327	3,885	4,212	53	945	3,363	4,361
D-3 TARIJA	64	275		339		388	164	472	18	382	1,413	1,800	75	956	1,577	2,517
D-4 COCHABAMBA	485	119		604	7	57	131	195	5	911	1,854	1,969	417	1,887	1,185	2,889
D-5 SANTA CRUZ	368	177	13	558		358	499	858	55	966	3,134	4,155	423	1,581	3,647	5,571
D-6 ORURO	225	163		388		396	586	981		422	4,616	5,038	225	981	5,282	6,487
D-7 POTOSI	21	238	7	266		182	319	421		242	4,152	4,394	21	575	4,477	5,873
D-8 TUPIZA						191	283	474		384	2,171	2,555		575	2,454	3,029
D-9 BENI		268	534	802		43	287	330		2	159	161		385	988	1,285
D-10 PANDO		39	139	178			115	115			187	187		39	441	489
TOTAL COUNTRY	1,328	1,988	1,078	4,394	271	1,733	2,889	4,893	118	4,994	22,862	27,965	1,789	8,715	26,826	37,252

NATIONAL NET MAINTENANCE PROGRAM 1994

DISTRICT	MAIN ROADS				COMPLEMENTARY ROADS				FEEDER ROADS				TOTAL BY DISTRICT			
	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL
D-1 LA PAZ	191	155	219	565	264	238	294	786	48	1,359	2,969	4,367	494	1,744	3,452	5,726
D-2 CHUQUISACA	53	571	166	791		47	211	258		327	3,805	3,332	53	945	3,333	4,381
D-3 TARIJA	173	164		337		308	164	472	18	382	1,413	1,806	183	854	1,577	2,615
D-4 COCHABAMBA	591	119		711	7	57	131	195	5	911	1,854	1,969	684	1,887	1,165	2,676
D-5 SANTA CRUZ	632	177	13	821		651	499	1,151	55	966	3,134	4,155	687	1,794	3,647	6,127
D-6 ORURO	225	163		388		396	586	981		622	4,616	5,838	225	981	5,282	6,487
D-7 POTOSI	21	238	7	258		182	319	421		242	4,152	4,394	21	575	4,477	5,873
D-8 TUPIZA						191	283	474		384	2,171	2,555		575	2,454	3,829
D-9 BENI	258	268	534	1,044		43	287	338		2	159	161	258	385	980	1,535
D-16 PANDO		39	139	178			115	115			187	187		39	441	468
TOTAL COUNTRY	2,137	1,877	1,878	5,892	271	2,026	2,889	5,186	118	4,994	22,868	27,965	2,518	8,897	26,925	38,243

NATIONAL NET MAINTENANCE PROGRAM 1995

D I S T R I C T	MAIN ROADS				COMPLEMENTARY ROADS				FEEDER ROADS				TOTAL BY DISTRICT			
	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL	PAVED	GRAVEL	EARTH	TOTAL
D-1 LA PAZ	233	155	219	607	264	238	294	796	98	1,359	2,969	4,416	589	1,744	3,482	5,813
D-2 CHUQUISACA	53	571	166	790		47	211	258		327	3,005	3,332	53	945	3,383	4,361
D-3 TARIJA	173	164		337		388	164	472	18	382	1,413	1,806	183	854	1,577	2,615
D-4 COCHABAMBA	591	119		710	7	57	131	195	5	911	1,854	1,969	684	1,087	1,185	2,876
D-5 SANTA CRUZ	695	177	13	885		651	499	1,151	55	966	3,134	4,155	758	1,794	3,647	6,198
D-6 ORURO	225	163		388		396	596	991		422	4,616	5,038	225	981	5,202	6,407
D-7 POTOSI	21	238	7	266		182	319	421		242	4,152	4,394	21	575	4,477	5,873
D-8 TUPIZA						191	283	474		384	2,171	2,555		575	2,454	3,029
D-9 BENI	268	477	534	1,279		43	287	330		2	159	161	268	522	988	1,762
D-10 PANDO		39	139	178			115	115			187	187		39	441	480
TOTAL COUNTRY	2,252	2,894	1,878	5,425	271	2,826	2,889	5,186	161	4,994	22,868	28,815	2,684	9,114	26,828	36,626

MAINTENANCE PROGRAM

1992 - 1995

SUMMARY

YEAR	FORCE ACCOUNT								PERIODIC MAINTENANCE (BY CONTRACT)				TOTAL MAINTENANCE PROGRAM
	ROUTINE MAINTENANCE		PERIODIC MAINTENANCE		EMERGENCY ACTIVITIES		TOTAL		PAVED ROAD		GRAVEL ROAD		
	KM	\$US	KM	\$US	KM	\$US	KM	\$US	KM	\$US	KM	\$US	\$US
1992	37,161	12.9	9,128	4.2	-	1.2	37,161	18.2	216.4	10.9	258.0	7.2	36.3
1993	37,252	13.0	8,715	4.2	-	1.1	37,252	18.4	246.7	14.8	258.0	7.0	40.2
1994	38,243	13.0	8,897	4.9	-	1.2	38,243	19.9	185.3	7.1	145.0	2.6	29.6
1995	38,626	14.8	9,114	5.0	-	1.2	38,626	21.1	169.0	6.7	134.0	3.2	31.0
TOTAL 1992-1995	-	54.5	-	18.3	-	4.7	-	77.5	817.4	39.5	795.0	20.0	137.0

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BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Road Maintenance Equipment and Workshops

Equipment Fleet

1. Traditionally, external financing to SNC has been mainly allocated either to equipment acquisition or to construction programs requiring new equipment (not adequate for maintenance activities), which is transferred to SNC at the end of the programs. So, SNC has a large fleet of construction and maintenance equipment with 1672 units, operating or available to operate and about 1500 old units to be sold at an auction. Out of the 1386 units available in the current SNC road maintenance fleet, 400 (29%) are less than 5 years old; 215 (15%) between 5 and 10 years old; 383 (28%) 10 to 15 years old; and 388 (28%) 11 to 15 years old. (At present, 308 units need rehabilitation or major repairs). Table 1 shows the various equipment groups and the current condition of each group. In addition, new units have been added to SNC's fleet during 1991, financed by several loans, credits and donations. This financing has allowed SNC to purchase 466 new units in 1991 (some of them under IDA RIC-II, Credit 1828-BO) which gradually will replace old units. Table 2 contains the list of this new equipment. At present, SNC has a shortage of current funds to satisfactorily operate such a fleet. In addition, IDA recommends that some periodic maintenance be carried out by contract and this is not consistent with additional equipment purchases. Furthermore, the current road maintenance fleet of SNC, after the new purchases, is large enough to carry out the 1992-95 routine maintenance program, if it is maintained and rehabilitated in a proper and timely manner. Therefore, purchases of new equipment are not necessary for the maintenance programs 1992-1995, unless new units are justified by future adjustments of these programs.

Equipment Management

2. Equipment management was poor before 1991. Many units are in poor condition because they were not properly operated and maintained. SNC's capital investment in equipment must be better protected by observing regular preventive maintenance. The first steps in this direction were taken under technical assistance financed under Credit 1587-BO, to design an equipment management system (SAE), now in phase of implementation in the five southern districts with CAF financing, and in the other five districts with IDA financing through the Export Corridors Project (Credit 2012-BO). With the implementation of the SAE, completed in January 1992, SNC will be able to achieve satisfactory programs for equipment rehabilitation, repairs and maintenance, matched to the real needs arising from the road maintenance programs.

3. Furthermore, the existing structure for equipment administration must be strengthened. Annex 6 contains a proposal for adapting SNC's current personnel organization, including equipment administration to the future decentralization. In the future, each equipment unit should preferably be

assigned to a specific operator who will be responsible for its operation and maintenance. These operators should be trained under a program within the SNC. Due to the lack of tenure in operator positions, the program should be permanent. The training will serve to improve the present quality of operation and maintenance. This Project includes a training program for equipment operators and SAE users (see Annex 11).

Equipment Rehabilitation

4. Equipment rehabilitation can save SNC thousands of dollars in capital investment. In view of its recent and approved equipment purchases, SNC should not buy new units until a plan for the rehabilitation of its equipment is finalized. This plan must be responsive to the equipment needs of the road maintenance programs. Consequently, an Equipment Rehabilitation and Major Repairs Program has been prepared by SNC with technical assistance financed under Credit 2012-BO. This program includes the needs for equipment rehabilitation and major repairs during the period 1992-95 and was prepared including all units more than three years old in 1991. It is based on the needs in equipment availability to carry out maintenance works, included in the 1992-95 maintenance programs, by force account. Table 3 shows the list of units to be rehabilitated in that period. The cost of the program would be US\$3 million, financed by the Project.

5. Ideally, the equipment rehabilitation program should be carried out in SNC workshops. This would be possible if SNC workshops had proper tools, workshop equipment and competent personnel. The first two conditions have basically been met (Credit 1587-BO provided funds for it) but SNC's workshop organization is still the limiting factor to carrying out a program of such a magnitude. Until this situation improves, rehabilitation will have to be carried out by contract. This contracting system will have an additional advantage of preventing the expansion of SNC staff without tenure of their low salary level positions. Allowing SNC mechanics to work in the local contractor workshops, could reduce the cost to SNC and provide mechanics with valuable on-the-job training. The firms to be considered for contracting equipment rehabilitation could be local equipment distributors, if their capabilities, facilities and experience with SNC are acceptable.

Equipment Operational Costs and Repair

6. During the years of the project, large resources will be needed to operate the equipment for the road maintenance programs. Table 4 shows a summary of the equipment requirements on fuel, lubricants, tires and spare parts to make SNC's equipment available and operational in the period 1992-95. To ensure that sufficient funds are available to operate the equipment, the Project will finance US\$11.8 million for acquisition of tires and spare parts for repairs, during the period 1992-95. Close supervision will be needed to monitor resources allocated and to ensure that they are applied effectively to maintain the equipment availability and utilization.

7. Minor repairs included in the equipment repair programs will be carried out by SNC's and local suppliers workshops that have adequate facilities. In many cases, these minor repairs could be done efficiently, at low costs, by contracting mechanics operating small workshops. In these cases, SNC would

provide the necessary spare parts and supplies and the contractor would provide the mechanics. As an alternative, the workshop would provide its own labor for specific tasks and would guarantee the quality of the labor. Since the work capacity of the contracted mechanics and the workshops is limited, flexible procurement procedures would be used to award small contracts for the repair of SNC equipment. SNC would be the responsible for the work done under this arrangement.

Workshop, Warehouse and Workcompound Organization and Needs

8. Adequate work compound workshops and warehouses are essential to maintaining of a road network and an equipment fleet. SNC's facilities are classified according to their geographical location, and type and complexity of mechanical work to be performed. Since SNC's warehouses and workshops were generally inadequate, the 1587-BO Credit financed the rehabilitation of these facilities. However, some of them still need important improvements. The cost is estimated at US\$3.5 million. Table 5 shows a breakdown of the resources that will be needed for this purpose.

SERVICIO NACIONAL DE CAMINOS

(DRAFT) SNC'S ROAD MAINTENANCE EQUIPMENT BY AGE AND CONDITION

EQUIPMENT DESCRIPTION	AGE OF EXISTENT EQUIPMENT				IN SERVICE			REPARABLE			
	0-5	5-10	10-15	+15	TOTAL	GOOD	NEED REPAIR	TOTAL	MINOR	REHAB	TOTAL
:LOADERS < 2M3		5	19	11	35	20	10	30	5	10	15
:LOADERS => 2M3	31	7	5	24	67	54	6	60	3	3	6
:MOTORGRADERS > 125 HP	28	28	17	101	174	30	44	74	20	20	40
:MOTORGRADERS < 125 HP	12	7			19	10	9	19	4	13	17
:TRACTOR <= 125 HP	12	20	30	29	91	50	42	92	31	21	52
:AGRICULTURAL TRACTOR		2	23	5	30	24	3	27		1	1
:PRIMARY CRUSHER	5		4	5	14	11	3	14		1	1
:SECONDARY CRUSHER			5	3	8	6	2	8			0
:VIBRATING COMPACTOR			3		3	3		3			0
:DUMP TRUCK <= 5M3	9	86	120	21	236	46	93	139	25	30	55
:WATER TRUCK 6000-10000 LTS	12	1	5	8	26	21	5	26	1	2	3
:PICK UP 4X4	39	9	39	17	104	83	15	98	10	2	12
:TRUCKS 4-8 TON	13		18	36	67	35	18	53	8	3	11
:ASPHALT IRRIGATOR TRUCK	1		4		5	3	2	5		1	1
:WATER PUMP D = 6 PLG								0			0
:COMPRESSOR 525 C.F.M.		5	30	25	60	34	20	54	11	1	12
:ASPHALT HEATER					0			0			0
:COMPACTORS	2	2	6	15	25	15	3	18	2	1	3
:NEUMATIC HAMMER	2	1			3	3		3			0
:PATCH UNITS	6	5			11	5	6	11			0
:THERMAL TRUCKS	3		2		5	2	1	3			0
:VIBRATING ROLLER	1	2	5		8	3		3			0
:ASPHALT MIXER PLANTS		2	1	1	4			0			0
:CLASSIFIER PLANTS	2	1		1	4	3	1	4			0
:DUMP TRUCKS > 7.5 M3	148	8		9	165	40	16	56	28	20	48
:UTILITY VEHICLES	20	6	20	15	61	62	7	69	3	3	6
:PICK-UPS	27		1	16	44	83	15	98	4	5	9
:JEEPS	8	7	8	12	35	29	6	35	3	1	4
:MOBILE LUB-UNITS			4	3	7	4	1	5	2	1	3
:REPAIR TRUCKS		7	1	16	24	14	6	20	2		2
:FLAT - BEDS TRUCKS	9		2		11	11		11			0
:FUEL TRUCKS	10	4	11	15	40	31	9	40	6	1	7
TOTAL	400	215	383	388	1386	735	343	1078	168	140	308
BUILD EQUIPMENT TOTALS					286						
EQUIPMENT TOTALS					1672						

SERVICIO NACIONAL DE CAMINOS

COMPLEMENTARY EQUIPMENT LIST

T I P O D E E Q U I P O	OPERATING	REPAIR	TOTALS
:TRACTOR > 220 HP	34	8	42
:TRACTOR > 300 HP	4	2	6
:MOTOTRAILLAS AUTOCARGANTES	1	2	3
:MOTOTRAILLAS CONVENCIONALES	8	3	11
:WHEEL TRACTOR	6	0	6
:NEUMATIC ROLLER COMPACTOR	11	4	15
:VIBRATING REMOLCABLE COMPACTOR	8	14	22
:HANDLE MANUAL ROLLER	7	16	23
:COMPACTADOR MANUAL PLACA	25	22	47
:CRUSHER EQUIPMENT 50/100 TONS.	0	2	2
:BACKHOES	2	0	2
:WHEEL BACKHOES	1	0	1
:TANDEM POWERED SCRAPERS	3	6	9
:TRACK-TYPE SCRAPERS	2	3	5
:ESCOBA MECANICA	1	4	5
:PAVEMENT BREAKER	1	3	4
:ASPHALT PLANT	0	0	0
:STRIPPED PAINTING MACHINE	5	0	5
:ELECTRICAL GROUP 10 KW.	17	18	35
:ELECTRICAL GROU 50 KW.	23	4	27
:ELECTRICAL GROUP 200 KW.	13	3	16
T O T A L S	172	114	286

(1 - 5AA.WK1)

NEW EQUIPMENT LIST FOR "SERVICIO NACIONAL DE CAMINOS"

GERMAN-JAPAN-CAF & O.E.C.F. LOANS

DESCRIPTION	G.C.	RIC II	CAF COCHABAMBA STA. CRUZ	C.V. POTOSI	C.V. LA PAZ	TOTAL
: BULLDOZER SCRAPERS TRACTORS	:	:	6 :	7 :	7 :	20 :
: BULLDOZER WHEELS TRACTORS	2 :	:	6 :	5 :	:	13 :
: MOTORGRADERS	6 :	:	5 :	7 :	7 :	25 :
: WHEEL LOADERS	2 :	5 :	3 :	:	5 :	15 :
: CRUSHER PLANT	:	2 :	:	2 :	2 :	6 :
: PORTABLE CLASSIFIER	:	10 :	:	:	:	10 :
: PATCH UNITS	8 :	10 :	:	:	:	18 :
: HYDRAULIC EXCAVATORS	5 :	6 :	4 :	:	:	15 :
: FLAT-BED TRUCKS	1 :	2 :	:	1 :	1 :	5 :
: DUMP TRUCK	24 :	20 :	16 :	25 :	25 :	110 :
: WATER TRUCK	:	40 :	:	2 :	2 :	44 :
: FUEL TRUCK	5 :	:	2 :	2 :	2 :	11 :
: TRUCKS 4-8 TON.	:	10 :	:	2 :	:	12 :
: TRACTOR-DUMP TRUCKS	:	:	1 :	:	:	1 :
: REPAIR TRUCKS	:	:	:	1 :	1 :	2 :
: PICK UP 4x4	:	30 :	7 :	6 :	6 :	49 :
: UTILITY VEHICLES	:	:	:	1 :	:	1 :
: AGRICULTURAL TRACTORS	:	:	4 :	:	:	4 :
: PORTABLE COMPRESSOR	:	10 :	:	:	:	10 :
: TAMPER COMPACTOR	:	:	5 :	:	:	5 :
: NEUMATIC ROLLOVER COMPACTOR	:	:	:	4 :	4 :	8 :
: ELECTRIC GENERATOR	:	10 :	5 :	2 :	2 :	19 :
: ROLLOVER HANDLE COMPACTOR	11 :	:	:	:	:	11 :
: PAVEMENT BRAKERS	20 :	:	:	:	:	20 :
: STRIPPING EQUIPMENT	4 :	:	:	:	:	4 :
: DRILLING EQUIPMENT	1 :	:	:	:	:	1 :
: CONCRETE TUBES FACTORY	3 :	:	:	:	:	3 :
: STATIONARY TANKS	:	:	:	6 :	6 :	12 :
: NEUMATIC HAMMERS	:	:	:	12 :	:	12 :
TOTAL	92	155	64	85	70	466

G.C: GERMAN LOAN MERCANCIAS II

RIC II PHASE II - O.E.C.F.

CAF PROJECT. CAF LOAN.- COCHABAMBA-SANTA CRUZ ROAD RAHABILITATION

C.V. JAPAN DONATION - RURAL ROADS IMPROVEMENT. POTOSI

C.V. JAPAN DONATION- RURAL ROADS IMPROVEMENT. LA PAZ

SERVICIO NACIONAL DE CAMINOS

ANNEX 4

Table 3 (i)

EQUIPMENT REHABILITATION PROGRAM
(1992-1993)

(1 - 5D.wk1)

FIRST PERIOD (1992-1993)	TYPE OF WORK	UNITS	UNIT COST OF REPAIRMENT	TOTAL COST	REPLACING COST	REP. COST. / ADQ. COST.
TRACTORS < 125 HP	REPAIR	3	4,750.00	14,250.00	88,000.00	5.40%
	RECONSTRUCTION	2	18,500.00	37,000.00	88,000.00	21.02%
TRACTORS < 160 HP	REPAIR	13	8,650.00	112,450.00	130,000.00	6.65%
	RECONSTRUCTION	19	22,244.00	422,636.00	130,000.00	17.11%
MOTOR GRADERS	REPAIR	14	7,650.00	107,100.00	95,000.00	8.05%
	RECONSTRUCTION	20	18,250.00	365,000.00	95,000.00	19.21%
LOADERS	REPAIR	5	6,250.00	31,250.00	100,000.00	6.25%
	RECONSTRUCTION	8	17,500.00	140,000.00	100,000.00	17.50%
DUMP-TRUCKS	REPAIR	24	3,500.00	84,000.00	55,000.00	6.36%
	RECONSTRUCTION	32	9,850.00	315,200.00	55,000.00	17.91%
WATER TRUCKS	REPAIR	1	2,500.00	2,500.00	50,000.00	5.00%
	RECONSTRUCTION	1	8,760.00	8,760.00	50,000.00	17.52%
FUEL TRUCKS	REPAIR	4	3,840.00	15,360.00	50,000.00	7.68%
	RECONSTRUCTION	1	6,250.00	6,250.00	50,000.00	12.50%
PICK UPS	REPAIR	9	2,750.00	24,750.00	19,000.00	14.47%
	RECONSTRUCTION	4	5,500.00	30,000.00	19,000.00	28.95%
REPAIRMENT TRUCKS	REPAIR	1	6,500.00	6,500.00	60,000.00	10.83%
	RECONSTRUCTION	0	0	0.00	60,000.00	0.00%
COMPACTORS	REPAIR	1	2,500.00	2,500.00	24,000.00	10.42%
	RECONSTRUCTION	1	6,000.00	6,000.00	24,000.00	25.00%
PERSONNAL CARRIERS	REPAIR	2	1,573.00	3,146.00	26,000.00	6.05%
	RECONSTRUCTION	2	5,629.00	11,258.00	26,000.00	21.65%
JEEPS	REPAIR	2	1,500.00	3,000.00	17,500.00	8.57%
	RECONSTRUCTION	1	3,570.00	3,570.00	17,500.00	20.40%
TRUCKS	REPAIR	5	2,500.00	12,500.00	50,000.00	5.00%
	RECONSTRUCTION	2	10,000.00	20,000.00	50,000.00	20.00%
COMPRESSORS	REPAIR	7	1,500.00	10,500.00	35,000.00	4.29%
	RECONSTRUCTION	1	4,000.00	4,000.00	35,000.00	11.43%
BUSES	REPAIR	1	1,800.00	1,800.00	46,000.00	3.91%
	RECONSTRUCTION	1	5,000.00	5,000.00	46,000.00	10.87%
AGRIC. TRACTORS	REPAIR	0	0.00	0.00	40,000.00	0.00%
	RECONSTRUCTION	1	10,500.00	10,500.00	40,000.00	26.25%
ASPHALT IRRIGATORS	REPAIR	0	0.00	0.00	70,000.00	0.00%
	RECONSTRUCTION	1	9,500.00	9,500.00	70,000.00	13.57%
CRUSHERS	REPAIR	0	0.00	0.00	120,000.00	0.00%
	RECONSTRUCTION	1	10,000.00	10,000.00	120,000.00	8.33%
ELECTRIC GENERATORS	REPAIR	0	0.00	0.00	13,000.00	0.00%
	RECONSTRUCTION	1	2,050.00	2,050.00	13,000.00	15.77%
SUBTOTAL		191		1,838,330.00		

SERVICIO NACIONAL DE CAMINOS

:: (1 - SD.WK1)

ANNEX 4

Table 3 (ii)

EQUIPMENT REHABILITATION PROGRAM
(1994-1995)

SECOND PERIOD (1994-1995)	TYPE OF WORK	UNITS	UNIT COST OF REPAIRMENT	TOTAL COST	REPLACING COST	REP. COST. / ADQ. COST.
TRACTORS < 125	REPAIR	2	4,750.00	9,500.00	80,000.00	5.94%
	RECONSTRUCTION	2	18,500.00	37,000.00	80,000.00	23.13%
TRACTORS < 160	REPAIR	8	8,650.00	69,200.00	130,000.00	6.65%
	RECONSTRUCTION	12	22,244.00	266,928.00	130,000.00	17.11%
MOTOR GRADERS	REPAIR	10	7,650.00	76,500.00	95,000.00	8.05%
	RECONSTRUCTION	13	18,250.00	237,250.00	95,000.00	19.21%
LOADERS	REPAIR	3	6,250.00	18,750.00	100,000.00	6.25%
	RECONSTRUCTION	5	17,500.00	87,500.00	100,000.00	17.50%
DUMP-TRUCKS	REPAIR	16	3,500.00	56,000.00	55,000.00	6.36%
	RECONSTRUCTION	21	9,850.00	206,850.00	55,000.00	17.91%
WATER TRUCKS	REPAIR	0	2,500.00	0.00	50,000.00	5.00%
	RECONSTRUCTION	1	8,760.00	8,760.00	50,000.00	17.52%
FUEL TRUCKS	REPAIR	2	3,840.00	7,680.00	50,000.00	7.68%
	RECONSTRUCTION	0	6,250.00	0.00	50,000.00	12.50%
PICK UPS	REPAIR	6	2,750.00	16,500.00	19,000.00	14.47%
	RECONSTRUCTION	2	7,500.00	15,000.00	19,000.00	39.47%
REPAIRMENT TRUCKS	REPAIR	1	6,500.00	6,500.00	60,000.00	10.83%
	RECONSTRUCTION	0	0	0.00	60,000.00	0.00%
COMPACTORS	REPAIR	1	2,500.00	2,500.00	24,000.00	10.42%
	RECONSTRUCTION	0	6,000.00	0.00	24,000.00	25.00%
PERSONNAL CARRIERS	REPAIR	1	1,573.00	1,573.00	26,000.00	6.05%
	RECONSTRUCTION	1	5,629.00	5,629.00	26,000.00	21.65%
JEEPS	REPAIR	1	1,500.00	1,500.00	17,500.00	8.57%
	RECONSTRUCTION	0	3,570.00	0.00	17,500.00	20.40%
TRUCKS	REPAIR	3	2,500.00	7,500.00	50,000.00	5.00%
	RECONSTRUCTION	1	10,000.00	10,000.00	50,000.00	20.00%
COMPRESSORS	REPAIR	4	1,500.00	6,000.00	35,000.00	4.29%
	RECONSTRUCTION	1	5,000.00	5,000.00	35,000.00	14.29%
	RECONSTRUCTION	1	2,050.00	2,050.00	40,000.00	5.13%
					40,000.00	0.00%
SUBTOTAL		118		1,161,670.00		
GRAND TOTAL		309		3,000,000.00		

ANNEX 4

Table 3 (iii)

SERVICIO NACIONAL DE CAMINOS

EQUIPMENT REHABILITATION PROGRAM BY YEAR

ITE	DESCRIPTION	QTY	1992 US\$	QTY	1993 US\$	QTY	1994 US\$	QTY	1995 US\$	TOTAL US\$
1	TRACTORS < 125 HP	4	35,875.00	1	15,375.00	3	30,225.00	1	16,275.00	97,750.00
2	TRACTORS < 160 HP	22	374,560.00	10	160,526.00	13	218,483.00	7	117,645.00	871,214.00
3	MOTOR GRADERS	24	330,470.00	10	141,630.00	15	203,938.00	8	109,812.00	785,850.00
4	LOADERS	9	119,875.00	4	51,375.00	5	69,063.00	3	37,187.00	277,500.00
5	DUMP-TRUCKS	39	279,440.00	17	119,760.00	24	170,853.00	13	91,997.00	662,050.00
6	WATER TRUCKS	1	7,882.00	1	3,378.00	1	8,760.00	0	0.00	20,020.00
7	FUEL TRUCKS	4	15,127.00	1	6,483.00	1	4,992.00	1	2,688.00	29,290.00
8	PICK UPS	9	38,325.00	4	16,425.00	5	20,475.00	3	11,025.00	86,250.00
9	REPAIRMENT TRUCKS	1	4,550.00	0	1,950.00	1	6,500.00	0	0.00	13,000.00
10	COMPACTORS	1	3,950.00	1	2,550.00	1	2,500.00	0	0.00	11,000.00
11	PERSONAL CARRIERS	3	10,083.00	1	4,321.00	1	4,681.00	1	2,921.00	21,606.00
12	JEEPS	2	4,599.00	1	1,971.00	1	1,500.00	0	0.00	8,070.00
13	TRUCKS	5	22,750.00	2	9,750.00	3	11,375.00	1	6,125.00	50,000.00
14	COMPRESSORS	6	10,150.00	2	4,350.00	4	8,483.00	2	4,567.00	27,550.00
15	BUSES	2	6,800.00	0	0.00	0	0.00	0	0.00	6,800.00
16	AGRIC. TRACTORS	1	10,500.00	0	0.00	0	0.00	0	0.00	10,500.00
17	ASPHALT IRRIGATORS	1	9,500.00	0	0.00	0	0.00	0	0.00	9,500.00
18	CRUSHERS	1	10,000.00	0	0.00	0	0.00	0	0.00	10,000.00
19	ELECTRIC GENERATORS	1	2,050.00	0	0.00	0	0.00	0	0.00	2,050.00
		136	1,298,486.00	55	339,844.00	78	761,828.00	40	399,842.00	3,000,000.00
	Z		43.28%		17.99%		25.39%		13.33%	100.00%

SERVICIO NACIONAL DE CAMINOS

EQUIPMENT OPERATIONAL COSTS (US\$ Million)

ITEM\YEAR	1992	1993	1994	1995	TOTAL
FUELS AND LUBS.	6,800,000.00	6,700,000.00	6,900,000.00	7,300,000.00	27,700,000.00
TIPES *	1,600,000.00	1,600,000.00	1,700,000.00	1,700,000.00	6,600,000.00
GROUND ENGAGED					
SPARE PARTS	5,600,000.00	5,600,000.00	5,800,000.00	6,200,000.00	23,200,000.00
TOTAL \$us.	14,000,000.00	13,900,000.00	14,400,000.00	15,200,000.00	57,500,000.00

THE OPERATIONAL COSTS WERE DEDUCTED FROM THE MAINTENANCE PROGRAM FOR 1992/1995
CALCULATED BY SAM ACCORDING WITH S.N.C. ROAD REQUIREMENTS

EQUIPMENT OPERATIONAL HOURS: 1000 hrs/year

(SE.wk1)

ANNEX 4

Table 5

WORK CAMP AND WORKSHOP CONSTRUCTION PROGRAM

(1992 - 1995)

DESCRIPTION	UNITS	UNIT COST	PARTIAL COST
Resident Engineer's Office =====			
Offices and housing			
Technical Staff	9	25,725	231,525
Work camp	11	31,980	351,780
Dining room and Instalations	8	31,450	251,600
Workshop	16	9,965	159,440
Watchman office	16	6,132	98,112
Sectional =====			
Sectionals	45	31,980	1,439,100
Dining-room with instalations	45	15,800	711,000
Potosi District =====			
Sub-Central Workshop	Global	---	120,000
Oruro District =====			
Offices and Workshop	Global	---	47,000
Kitchen House-Hold	Global	---	90,443
T O T A L			3,500,000 =====

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Road Infrastructure Financing Study

Objectives

1. The study of Road Infrastructure Financing is designed to provide information on which the Government can make a decision on what standards of design should be used for different types of roads, how the development and maintenance of those roads should be planned, administered and undertaken, and how that development and maintenance should be financed. The study will pay particular attention to the extent to which road users should contribute to the costs of road financing and how the costs should be allocated between different types of road users. The study will also review the consequences of the policy of road decentralization.

2. The study is being undertaken in two phases. The first phase, which was financed by the Export Corridors Project and completed early in 1992, was designed to produce an initial analysis of the necessary and justified costs of road maintenance using the current standards of design and maintenance, and to provide an analysis of the alternative ways in which this scale of maintenance activity could be financed. The second phase will include:

- i) recommendations for the detailed implementation of the government's policy based on the conclusions of the first part of the study;
- ii) an extensive review of road design and maintenance standards applied in Bolivia;
- iii) a detailed road maintenance and construction cost analysis;
- iv) a Road Investment Plan for the next four years; and
- v) a Road Maintenance and Investment Plan.

3. The remainder of this Annex is in two parts. The first part (A) provides a summary of the methodology used, assumptions made in the analysis and the recommendations of the first phase of the Study, while the second part (B) provides the Terms of Reference for the second phase of the Study.

PART A: Summary of Method, Assumptions and Results
of the First Phase of the Road Financing Study

4. The first phase of the Study was concerned with determining the most appropriate way of ensuring that funds would be made available to finance

an adequate level of road maintenance, once the Project was completed. In the introduction to this phase of the Study, a distinction was made between taxes and user charges. The former were considered to be government charges which were independent of the use made of a particular service or facility and whose revenue formed part of the general government revenue fund. A user charge was considered to be a charge for the use of a specific service, whose incidence to the user was proportional to his use of the service, and the revenue from which was used to finance the provision of that service. The provision and maintenance of the national road network was considered as a service, similar to that of the provision of other government communications networks, such as post, telephone and railways. Finance for the maintenance of the infrastructure of such services should be provided, so far as possible, by users in proportion to the benefits they receive from the service. This financing principle was taken as a guide in the analysis of alternative financing mechanisms. A recognition that a proportion of the benefits of an adequately maintained road network did not necessarily accrue to the users of the network was included in the alternative financing mechanisms analyzed.

5. Using these definitions, the current fuel surcharge and annual vehicle licenses were considered to be taxes and the current road tolls were considered to be user charges. The current requirement for a "Prestacion Vial", under which all adult males are required to provide a fixed amount of their time for maintaining the road network, or to pay a fee in lieu of that time, was also considered a tax as the "charge" was not related to use of the road network although the revenues from the charge were allocated exclusively to the road maintenance budget.

6. If a proposed financing scheme was to make use of earmarked revenues which currently form part of the national taxation revenue, the scheme would be subject to the accusation that it could be contrary to the objectives of fiscal reform, and distort the allocation of funds between competing demands for treasury funds. For this reason, all the financing schemes analyzed related to new users charges and would leave present treasury revenues from current user taxes unchanged. There would, therefore, be no earmarking of current treasury revenues.

7. The second part of the first phase of the Study reviewed the costs which should be covered from new user charge revenues and the projected levels of those costs. The costs which were considered as appropriate for user charge funding included those of routine maintenance (including bridge and emergency maintenance), periodic maintenance and maintenance administration. Continued use of loan finance for road maintenance activities was not considered appropriate for the period following the conclusion of the proposed Second Road Maintenance project, so finance of counterpart funding for future road maintenance project loans was not considered to be an issue. The costs of amortization of previous loans for road maintenance projects were analyzed, but it was concluded that the financing of these costs should not be the responsibility of future road users. Loan amortization costs are a consequence of previous lack of provision of road maintenance finance by the treasury, so their financing should continue to be the direct responsibility of the treasury.

8. The costs of routine maintenance were derived from the current unit maintenance costs included in the SAM, the road maintenance system used by SNC, the national highway authority. These unit costs, by type of road surface and District of SNC were applied to the projected future road network. A statistical analysis of the unit costs of road maintenance indicated by this model showed no significant correlation with the condition of the road surface.

9. The costs of periodic maintenance were also derived using a unit cost method applied to the future road network. The costs of resurfacing each of three types of road surface, gravel, single surface treatment and asphaltic concrete, were estimated from the costs of projects of this type included in the Second Maintenance Project. Since the next round of resurfacing of paved roads would be applied to roads which had been not only resurfaced but reconstructed and improves where necessary and economically justified, it was assumed the costs would be only those of resurfacing.

10. The frequency of the required resurfacing on each of 1,200 road sections was derived from an analysis of the life of the surface expressed in terms of equivalent axles, and the project volume and composition of the traffic for each road section. Maximum and minimum physical lives were applied to those sections of the network where the determination of life based on the equivalent axle life and traffic volume and composition was outside of the range of practical experience. The average annual cost of resurfacing each road section was obtained by dividing the appropriate total cost by the frequency of reconstruction. The resurfacing cost and road life assumptions are summarized in Table 1 of this Annex. The average annual cost of future periodic maintenance was obtained by summing the annual cost of each link.

11. The volume of periodic maintenance work implied by this procedure would be beyond the capabilities of the current SNC administration. It was therefore assumed that a period of four years would be required for the volume of work to build up to this equilibrium level.

12. The costs of administration of road maintenance were determined separately for routine and periodic maintenance. The routine maintenance administration cost estimate was based on the costs derived from the SAM for the Districts of SNC, plus an additional 15% for headquarters administration. The costs of administration of periodic maintenance were expressed as a proportion of the total costs of the projects to be administered.

13. The projected annual total costs of road maintenance, by type of maintenance and by fixed and variable cost, using this method are shown in Table 2 for the years 1996 to 2001.

14. The next part of the study analyzed alternative ways of financing this level of road maintenance expenditure from user charges. The user charges considered as suitable were road tolls, annual vehicle licenses and fuel price surcharges. Revenue from all of these sources could be considered as being related to use of the network, and therefore to be genuine user charges and not taxes. The National Treasury was also considered to be a

legitimate source of finance for part of the expenditure, since part of the benefits of adequate road maintenance would accrue to the national economy and not necessarily directly to users of the network. The proportion of benefits which could be retained by road users would depend on the level of competition in the road transport industry - less competition indicating a higher retention of benefits, more competition indicating a lower level of retention.

15. The alternative financing schemes considered included differing proportion of revenue from the four sources. The recommendation of which particular alternative to recommend were based on considerations of the proportion of variable maintenance costs attributable to each vehicle type, which would be covered by the projected revenues from user charges from that vehicle type. Each alternative scheme was required to produce sufficient revenue to cover not only the variable costs but also the total costs of maintenance. The difference between the sum of revenues needed to cover variable maintenance costs and the sum of revenues needed to cover total maintenance costs was designed to be generated in a way which would minimize the loss of economic benefit in the economy. This was achieved by proposing additional charges for those users which had the lowest elasticity of demand in respect to vehicle operating costs, in addition to allocating a proportion of the revenue generation to the National Treasury.

16. After a preliminary consideration by the Government, it was determined that a fuel surcharge would not be legal, although an additional tax on petroleum production would be legally acceptable. However, a production tax would not be the same as a user charge, and would not allow any discrimination in the impact on the users of gasoline and diesel. Such a discrimination would be necessary to ensure that commercial vehicles, which cause the most damage to the road surface and therefore, are attributed the highest maintenance costs, can be assigned an appropriate user charge.

17. It would be preferable for the scale of charges to be kept constant in real terms for as long as possible. However, the increase in periodic maintenance costs while building up to the equilibrium level would require a corresponding increase in charges since traffic volumes and vehicle numbers would not be increasing so fast over this period. One way of keeping charges constant in real terms while allowing for this cost increase would be to set the overall revenue from the charges at a level under that needed to finance the equilibrium level of maintenance but for them to be applied from the earlier date when the use of user charge financing was first implemented. This would allow a surplus to be built up in the earlier years, to be consumed in the later years. The creation of such a surplus would have two additional advantages in that it would provide a buffer against the unpredictable variation in annual maintenance costs and provide a source of working capital for the funding of reconstruction contracts.

18. The preferred financing scheme, which included a fuel price surcharge, was that shown in the second column of Table 3, while the recommended scheme, which excluded the fuel price surcharge and relied on only three revenue sources, road tolls, an annual vehicle license and a treasury contribution is shown in the third column of Table 3. The second part of

Table 3 shows revenues, financial results and the ratio of revenue to variable cost for each vehicle type in the equilibrium year of 2001, both for the preferred and recommended schemes.

19. For the procedure of creating a number of specific user charges to finance road maintenance, and for the revenues from these charges to build up an initial surplus, to work efficiently it would be necessary to create a Road Maintenance Fund (RMF). The user charge revenues could be deposited into the RMF account, and road maintenance expenditures could be financed exclusively from this account. The RMF would be administered by SNC as the agency responsible for road maintenance, but its operation would be subject to the normal safeguards applicable to government funds. These would include requirements for external auditing satisfactory to the Ministry of Finance, the undertaking of economic evaluations of all investment projects acceptable to the Ministry of Planning, and preferably the preparation of a three year road maintenance plan acceptable to the Ministry of Transport and Communications.

PART B: Terms of Reference for the Second Phase of the
Road Financing Study

Scope of the study

20. The study will provide:

- i) a detailed implementation plan for the policy for financing road maintenance, based on the recommendations of the first part of the study;
- ii) a review of the design standards used in countries at different stages of their economic development, and recommendations for standards applicable in Bolivia. The recommended standards should take particular account of the contribution that improved roads can make to national economic development and the financial capacity of the national economy;
- iii) a review of the different ways of administering the national road network, and the level of autonomy that road authorities should have. This activity should be coordinated with the studies of SNC's decentralization;
- iv) a theoretical analysis of road user charges in developing countries, with particular reference to Bolivia;
- v) a four-year Investment Plan for road construction and maintenance, taking account of resources available and including procedures for reviewing and updating this Plan;

- vi) an assessment of the financial capacity of road users to pay the costs of the Investment Plan;
- vii) recommendations for future government actions and proposal of a feasible plan for implementing these recommendations; and,
- viii) recommendations on how road construction agencies with different areas of responsibility should be financed.

21. The detailed implementation plan for the policy to finance road maintenance, based on the government's policy announced after receiving the recommendations of the first part of this study will include, but not necessarily be limited to:

- i) details of how SNC will administer the Road Maintenance Fund (RMF), in such a way as to ensure that the funds are used only for maintenance and not for new construction. The recommendations of the first part of the study provided the general principles which should be followed in establishing this mechanism;
- ii) details of how the revenues from each of the proposed sources of finance for the RMF will be collected and transferred to the Fund's account;
- iii) a detailed proposal for auditing the accounts of the Fund, ensuring that revenues are properly allocated and spent; and,
- iv) a detailed proposal for preparing a four-year rolling Maintenance Program, which will be the base for the needs of the RMF.

Theoretical framework for analysis

22. The Consultant will provide a sound economic and financial analysis of the issues related to road expenditure and its finance, with particular reference to the particular circumstances of Bolivia. These include a low level of development of the road network, low possibilities for public sector investment in the road network, low levels of ability to pay by road users, and higher than normal transport costs.

23. The expenditure analysis will take account of the economic and social benefits of road development, with particular emphasis on the impact of transport costs in international trade. Based on these assessments, general guidelines will be prepared for determining the overall justifiable level of road expenditure.

24. The revenue analysis will take account of the difference in coverage of average and marginal costs, and the attribution of costs to different types of vehicle, as well as the need for adequate financing of maintenance and construction costs. The Consultant will also need to take

into account the proposed decentralization of responsibility for road maintenance and construction activities.

Future financing needs

25. The Consultant will review future financing needs of the road network, taking account of current outstanding debts, probable new liabilities arising from future loans for road construction, and the costs of adequate routine and periodic maintenance of the whole national road network. This review will include an assessment of current road design and maintenance practices, with reference to their suitability for a country with strictly limited financial resources. The Consultant will also make recommendations for any revisions needed to current standards and practices.

26. The needs for future investment will take account of projected future traffic levels and changes in the composition of traffic. The Consultant will take account of the recommendations of the recent report on the implementation of axle load and vehicle weight regulation. The recommendations for future investment should be capable of implementation in Bolivia and be accompanied by a feasible implementation plan.

Alternative charging systems

27. The consultant will provide a comparative evaluation of alternative methods of financing future costs of road construction and maintenance. The review should pay particular attention to the conclusions reached in the first part of the study. It will include assessments of the ability of users to pay any charges and the impact of such charges on the general level of prices.

Recommendation and Implementation

28. Based on the results of the evaluation, the Consultant will recommend: i) an implementation plan and schedule for the Road Maintenance Fund, as recommended in the report of the first part of the study. The proposed schedule should allow the Government to satisfy the requirements of this Staff Appraisal Report; ii) design standards for different types of roads; iii) an appropriate road system management; and, iv) a suitable system of raising and allocating finance for road maintenance and construction. For the recommended system, the Consultant should review with all interested agencies, including those of road users, the feasibility of its implementation.

29. Based on these recommendations, an implementation plan should be prepared, detailing what actions should be taken and by whom. The implementation plan should be discussed with the agencies required to take actions, to ensure that they have the legal/legislative authority and technical capability and capacity for the actions they must take.

30. For the recommended system, detailed financial cash flow projections should be made for the next four years and outline projections for the following six years.

Resources

31. It is estimated that the Consultant will require about 20 man-months to carry out his task, according to the following distribution of activities:

- i) Implementation Plan for first stage proposals: 2 man-months
- ii) Review and recommendation of road design standard: 8 man-months
- iii) Review of theoretical aspects of road user charges: 2 man-months
- iv) Assessment of future road financing needs, including revision of current standards and methods: 3 man-months
- v) Evaluation of alternative user charge systems: 2 man-months
- vi) Consultation with interested agencies: 1 man-months
- vii) Development of an implementation plan: 2 man-months
- viii) Cash flow projections for all agencies: 2 man-months

Total: 20 man-months

ROAD RESURFACING COST ASSUMPTIONS

Table 1

Road type	Earth	Gravel	Single Surface	Ashphalt concrete
Resurfacing cost US\$ per km	0	12,000	30,000	55,000
Surface life in equivalent axles	0	200,000	800,000	1,600,000
Minimum surface life in years	0	0.5	2	4
Maximum surface life in years	0	8	8	12
Average routine maintenance cost US\$ per km	180	657	983	750

PROJECTIONS OF ROAD MAINTENANCE COSTS AND USER CHARGE REVENUES

Table 2f

a) Preferred scheme

	1995	1996	1997	1998	1999	2000	2001
	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
i) Maintenance costs							
Routine	19.1	12.5	12.8	13.1	13.4	13.8	14.1
Periodic	0.0	20.0	35.0	40.0	45.0	50.0	52.7
Total	19.1	32.5	47.8	53.1	58.4	63.8	66.8
Fixed	5.2	15.2	20.2	25.2	30.2	34.5	34.5
Variable	13.9	17.3	27.6	27.9	28.2	29.2	32.3
Total	19.1	32.5	47.8	53.1	58.4	63.8	66.8
ii) User charge revenues							
Vehicle license	4.2	4.3	4.4	4.6	4.7	4.9	5.1
Road toll	19.8	24.6	25.4	26.3	27.2	28.1	29.1
Fuel surcharge	11.8	12.2	12.6	13.0	13.5	13.9	14.4
Treasury		5.0	5.0	5.0	5.0	5.0	5.0
Total	35.8	46.1	47.5	48.9	50.4	52.0	53.5
iii) Financial analysis							
Annual surplus - US\$m	16.6	13.6	-0.3	-4.2	-8.0	-11.8	-13.2
Cumulative surplus - US\$m	16.6	30.2	29.8	25.6	17.6	5.8	-7.5
Revenue/Total cost	1.9	1.4	1.0	0.9	0.9	0.8	0.8
Revenue/Variable cost	2.6	2.7	1.7	1.8	1.8	1.8	1.7
iv) Revenue/Variable cost by vehicle type							
Motorcycle	3.45	6.99	6.94	6.90	6.86	6.83	6.79
Car	2.20	4.73	4.70	4.67	4.64	4.62	4.59
Jeep	3.21	6.81	6.76	6.72	6.69	6.65	6.61
Pick up	3.04	6.28	6.24	6.21	6.17	6.14	6.10
Van	2.66	5.47	5.44	5.40	5.37	5.34	5.32
Truck							
- 2 axles	2.28	1.63	1.00	1.02	1.05	1.05	0.97
- 3 axles	2.64	2.13	1.33	1.36	1.39	1.39	1.30
- 4 axles	2.97	1.55	0.90	0.93	0.95	0.95	0.88
- 5 axles	4.03	2.15	1.25	1.29	1.32	1.32	1.22
Urban bus - gasoline	4.29	7.52	6.03	6.09	6.15	6.12	5.89
Urban bus - diesel	2.42	4.61	3.87	3.90	3.92	3.91	3.79
Interurban bus	1.39	2.28	1.82	1.84	1.86	1.85	1.78
Total	2.57	2.67	1.72	1.75	1.79	1.78	1.66

PROJECTIONS OF ROAD MAINTENANCE COSTS AND USER CHARGE REVENUES

Table 211

b) Recommended scheme

	1995	1996	1997	1998	1999	2000	2001
i) Maintenance costs	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
Routine	19.1	12.5	12.8	13.1	13.4	13.8	14.1
Periodic	0.0	20.0	35.0	40.0	45.0	50.0	52.7
Total	19.1	32.5	47.8	53.1	58.4	63.8	66.8
Fixed	5.2	15.2	20.2	25.2	30.2	34.5	34.5
Variable	13.9	17.3	27.6	27.9	28.2	29.2	32.3
Total	19.1	32.5	47.8	53.1	58.4	63.8	66.8

	1995	1996	1997	1998	1999	2000	2001
ii) User charge revenues	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m	US\$m
Vehicle license	8.8	9.1	9.5	9.8	10.1	10.5	10.8
Road toll	19.8	24.6	30.5	31.6	32.6	33.7	34.9
Fuel surcharge	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Treasury		10.0	10.0	10.0	10.0	10.0	10.0
Total	28.7	43.7	50.0	51.3	52.7	54.2	55.7

	1995	1996	1997	1998	1999	2000	2001
iii) Financial analysis							
Annual surplus - US\$m	9.5	11.2	2.2	-1.8	-5.7	-9.6	-11.1
Cumulative surplus - US\$m	9.5	20.7	22.9	21.1	15.4	5.9	-5.2
Revenue/Total cost	1.5	1.3	1.0	1.0	0.9	0.9	0.8
Revenue/Variable cost	2.1	2.5	1.8	1.8	1.9	1.9	1.7

iv) Revenue/Variable cost by vehicle type

Motorcycle	0.42	1.00	1.20	1.19	1.18	1.18	1.17
Car	2.48	5.29	5.71	5.68	5.64	5.61	5.58
Jeep	2.45	5.31	5.84	5.80	5.77	5.74	5.71
Pick up	1.79	3.82	4.14	4.11	4.09	4.07	4.04
Van	1.43	3.05	3.30	3.28	3.26	3.24	3.22
Truck							
- 2 axles	1.69	1.25	0.89	0.91	0.93	0.93	0.87
- 3 axles	2.15	1.78	1.30	1.33	1.37	1.36	1.27
- 4 axles	2.56	1.37	0.94	0.96	0.99	0.99	0.91
- 5 axles	3.59	1.95	1.34	1.38	1.42	1.42	1.31
Urban bus - gasoline	4.29	7.52	7.23	7.30	7.37	7.35	7.07
Urban bus - diesel	2.42	4.61	4.65	4.68	4.71	4.69	4.54
Interurban bus	1.15	1.94	1.80	1.82	1.84	1.83	1.76
Total	2.06	2.53	1.81	1.84	1.87	1.85	1.73

PREFERRED AND RECOMMENDED SOURCES OF MAINTENANCE FUNDING

Table 3

Source of Finance	Preferred Scheme	Recommended Scheme
Annual vehicle license	US\$ 10 per vehicle plus US\$ 15 per rear axle for all freight vehicles	US\$ 25 per vehicle plus US\$ 20 per rear axle for all freight vehicles
Road tolls	Current tolls plus +20% in 1996. Evasion reduced to 20%.	Current tolls plus +20% in 1996 and a further 20% in 1997. Evasion reduced to 20%.
Fuel surcharge	Gasoline: US 1.0c /litre Diesel: US 1.5c /litre	Gasoline: None Diesel: None
Treasury	US\$ 5 million/year	US\$ 10 million/year

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Road Decentralization

Background

1. The Government of Bolivia is contemplating decentralizing the administration of services in the subsectors of road infrastructure, agriculture and cattle, sewerage, education and health. This decision aims at rationalizing and improving the provision of service and avoid duplications that now exist. It also aims at mobilizing local resources in order to reduce the financial burden on the Central Government. The decentralization will be effective through the transfer of functions --partially regulatory but basically technical-- of administrative and financial nature, from the Central Government to the departmental governments.

2. As a first step towards this decentralization, a draft decree ("Ley Basica") has been proposed to create new functions within the local governments; its approval is pending from Congress. Additionally, in support of the decentralization process, the Bank provided technical assistance for the preparation of a program to strengthen the economic functions of the public sector (Economic Management Strengthening Operation (EMSO)). This program included a component directed at the preparation of the basic proposal for decentralization.

3. In reference to the road infrastructure subsector, the National Road Service, Servicio Nacional de Caminos (SNC) is the institution in charge of the national road network. Since the needs, specially those of the regions, for more and better means of communications exceed the resources and the institutional capacity of execution of this entity, the regional development corporations have begun to undertake the execution of road works. These activities by the corporations, often carried out without adequate planning, have over-committed the scarce resources available to the SNC for road maintenance. It has also distorted the national road plan. Under these circumstances, the Government considers that the decentralization process will be an adequate measure to delimit responsibilities, establish jurisdictions and carry out the administration in the national and departmental governments.

EMSO's Proposal

4. The EMSO program has proposed a preliminary classification of the Bolivian road network (approx. 41,000 km.) into two categories: the Interdepartmental Road Network (around 8,000 km.) that will continue to be in charge of the Central Government through the SNC (see Table 1), and the Secondary and Rural Roads Network (around 33,000 km.) which will be under the responsibility of the departmental governments, through the proposed Road Department Directorates, Direcciones Departamentales de Vialidad (DDVs).

5. EMSO's proposal for decentralization of the subsector of road infrastructure defines the functions of the Central Government, the departmental governments and the subdepartmental districts. In a general manner, it also defines the functional character of the DDVs. The proposal also explores the form of distribution of equipment and use of human and financial resources.

6. The recommendation of the EMSO program for the decentralization of the road infrastructure can be summarized as follows:

- (a) The road infrastructure system of the country would be governed by the Ministry of Transportation and Communications (MTC) which would have among its responsibilities the formulation of the national transport policy in general, and the road policy in particular. The MTC would also define the length and the composition of the Basic Road Network (Red Vial Fundamental (RVF)). The MTC would assume regulative functions for the subsector and would make the necessary basic decisions. It would also approve the plans and programs for the development of the national road network, and the financial policies that, at the end, would be considered and approved by the National Planning Council "CONEPLAN", the Ministerial Cabinet and, if necessary by, the legislative power.
- (b) The RVF would be governed by the SNC, which would continue to be a decentralized body under the MTC. It would also function as the principal entity within the country's road system, in charge of regulating the subsector, and of monitoring the implementation of regulations throughout the country. The SNC would execute its functions through its Central Office, with headquarters in La Paz. The decentralized offices to be established in each departmental capital would be basically in charge of: (i) management and administration of the RVF; (ii) execution of the necessary roadwork to complete and improve the network; and (iii) road maintenance, by force account, by contract, or by agreed transfers to the regional entities, or a mixture of these, in a manner that contracts should be executed when medium-length road sections are involved, in order to promote competition among national construction firms.
- (c) The construction of new roads, as well as the maintenance of the existing ones, in the geopolitical-administrative jurisdiction of each Department in the country, which do not belong to the RVF (i.e., roads that make up the secondary and local network of each department) would be entrusted to a departmental road office (Dirección Departamental de Vialidad - (DDV) to be created as a decentralized regional institution, under the departmental government.

- (d) Due to the fact that today one of the main activities of the Regional Development Corporations (Corporaciones Regionales de Desarrollo (CORDs) is the execution of roadwork, these entities already have the necessary small-scale operational units, labor and mechanical equipment. Therefore, it is proposed that the existing Road Departments are reorganized and merged with the corresponding DDV in the Superintendent's Office of each department, in the case they exist, and also with the section of the existing SNC district, which would be transferred accordingly.
- (e) The new DDVs would be administered and managed in accordance with the institutional and technological criteria defined for this purpose. These criteria would allow adequate planning, sound project design, and construction of roads that are of interest to the region.
- (f) The road design, construction and rehabilitation in the secondary and local network in each Department, would have to be done by the corresponding DDV. These tasks would preferably be undertaken by contract, or by force account if the DDVs have enough operational capacity to do so without interfering with other of their responsibilities.
- (g) Maintenance of roads in the departmental secondary network would be initially carried out by the DDVs by force account, with the road equipment available, and with the human resources obtained from reactivation of the labor tax ("empleo de brazos"), which basically requires the communities to provide local labor in exchange for road services. Progressively, they would be able to introduce a maintenance system by contract, whenever possible. Also, they would be able to charge users' fees or tolls on the roads, as necessary.
- (h) The maintenance of the roads in the departmental rural network would be carried out by the DDVs, again using the human resources derived from the reactivation of the labor tax, described in (g) above, and with support of nearby communities. The same concept of the existing "food for labor" system would be applied. On a complementary basis, support could be sought from the mechanical units of road equipment, only when needed, and according to the type of works to be carried out.
- (i) The organizational chart proposed for the decentralization of the system is shown in Chart III. The basic organizational chart for the new DDVs is indicated in Chart IV.
- (j) The SNC and its district offices would retain the necessary staff to support the functions that they would have been assigned. The rest of the staff would be dismissed and transferred to the DDVs.

These, in turn, would absorb the roadwork units of the CORDs and of the superintendents' offices, in the case they exist.

- (k) SNC would only retain the road equipment that is considered strictly necessary to undertake, by force account, the maintenance works in the areas that are normally affected by landslides and slipping. The rest of the equipment that it now owns and that is useful after repairs, would be transferred to the DDVs free of charge. Equipment that is found obsolete or non-repairable, will be either fully depreciated or auctioned.
- (l) For servicing the RVF, the SNC would retain the buildings that now house its district offices, as well as the work camps it owns installed along the RVF. Other work camps would be similarly transferred to the DDVs free of charge.
- (m) As indicated above, the SNC would retain the work camps that it now owns, but would be responsible for providing maintenance and repair services of road equipment that the DDVs would own.
- (n) The RVF should be as extensive as possible to satisfy its design characteristics, and to fulfill the mandate that requires the Central Government to provide:
 - Communication among the departmental capitals.
 - Improvement of export corridors and of international linkage (Pan American Road System).

At early stages, the RVF should try to meet these objectives in order to maintain a direct relation with the economic/financial capabilities of the Central Government and the actual possibilities of completing, improving and adequately maintaining the RVF. Excessive capacity would imply heavier financial burdens. It would also prevent an efficient performance of the units in the provision of services. It is proposed that the RVF would initially be integrated by the routes indicated in Table 1.

Ongoing Studies

7. IDA is financing, under the Export Corridors Project, a consultant for assessing the work done by EMSO concerning road decentralization. This assessment focuses on the districts of Sta. Cruz and Tarija. Based on this assessment, the consultant will prepare detailed terms of reference to develop a realistic plan, based on the recommendations of the EMSO program, to initiate and make effective the decentralization process in the road subsector. The plan will include the following objectives:

- (a) to carry out a detailed analysis of the general and specific functions, both permanent and temporary, of the organization of the road subsector administration that would be required at the departmental level;

- (b) to classify the functions and jurisdictions and determine the appropriate transfers needed in the secondary and rural roads network;
- (c) to plan the servicing of the networks in the short and medium term;
- (d) to carry out a detailed estimate of human resources and functions in order to plan their distribution at departmental and subdepartmental level;
- (e) to carry out a detailed analysis of the financing, allocation and administration of national and departmental resources for road maintenance and rehabilitation.
- (f) to develop and transfer the planning, evaluation, contracting and monitoring systems for the projects;
- (g) to link, in a coordinated manner, the national and departmental entities and other support units; and
- (h) to develop a plan for the gradual and orderly implementation of the plan for road decentralization in the various departments of the country. Also, to facilitate the support and institutional strengthening that should be provided to the departmental entities in road activities.

Future Actions

8. As soon as the study mentioned above is completed, it will be possible to implement the necessary management systems in the DDVs with technical assistance financed under the proposed Project. This assistance will include (i) implementation of the SAM and the SAE in the new DDVs; (ii) training staff of the DDVs in the application of the system; (iii) analyze the requirements for human physical and financial resources for SNC and the new DDVs; (iv) organization and use of these resources after the decentralization. Detailed terms of reference for this technical assistance are included in Annex 9 (to be confirmed with the Government during negotiations). The project provides US\$1.0 million for this technical assistance.

PROPOSED INTERDEPARTMENTAL ROAD NETWORK
(BASIC NETWORK)

ROAD No.	ITINERARY	L E N G T H (Kms)			New Construction	Total
		Paved	Gravel	Earth		
1.	Desaguadero-La Paz (El Alto) Caracollo-Oruro-Fotosi-Tarija- Bermejo	344	876	---		1,220
	Oruro-Caihuasi Branch	---	39	---	---	39
2.	La Paz (El Alto)-Yucumo Rurrenabaque-Chive-Cobija	65	361	297	248	971
3.	Yucumo-San Borja-San Ignacio de Moxos-Trinidad	---	48	228	---	276
4.	Tambo Quemado-Patacamaya Caracollo-Cochabamba-Chimore- Yapacani-Guabira-Santa Cruz	603	241	---	---	844
5.	Ollague-Uyuni-Fotosi-Sucre-Epizana	18	351	449	---	818
6.	Sucre-Tarabuco-Padilla-Ipatí	---	204	217	---	421
7.	Cochabamba-Epizana-Materal-Santa Cruz	417	69	---	---	486
8.	Rurrenabaque-Santa Rosa-Riberalta- Guayaramerin	---	448	74	80	602
9.	Trinidad-San Ramón-Los Troncos- Pailón-Santa Cruz	18	532	---	---	550
10.	Villa Tunari-Puerto Patiño-San Ignacio de Moxos	---	50	---	245	295
11.	Tarija-Entre Ríos-Villamontes	---	212	26	---	238
12.	Pailón-Pozo del Tigre-San José de Chiquitos-Roboré-Puerto Suarez- Arroyo Concepción	17	---	78	513	608
13.	Santa Cruz (Km. 14)-Abapó-Ipatí Camiri-Boyuibe-Villamontes- Yacuiba-Pocitos	---	148	406	---	554
Total		1.482	3.579	1.775	1.086	7.922

Source: EMSO

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Traffic Counters and Laboratory Equipment

Traffic Counters

1. At present, SNC has 54 traffic counters installed on the road network. Out of them, some 34 were installed in 1980 and 20 in 1988, of which only 32 units (59%) are working satisfactorily, (20 magnetic counters and 12 pneumatic counters). There are 12 additional counters not yet installed. The needs for traffic counters have been analyzed by SNC during the preparation of the Project and the result is that 146 new counters are needed to cover adequately the network in the next four years, completing a total of 200 counters. Table 1 shows the distribution by district of the existing and the required counters. Taking into account the acquisition of the 146 counters, complementary equipment and spare parts, the cost of the program on traffic counters amounts to about US\$500,000 (see Table 2). The installation of the counters will be carried out by SNC's personnel in the districts. The proposed Project includes US\$350,000 for financing this sub-component.

Laboratory Equipment

2. The SNC has a Central Laboratory of Road Materials depending on its Geology and Geotechnic Division with sections for soil, asphalt and concrete testing. The staff of the Central Laboratory is composed of 18 technicians which are enough for the work to be performed. The main problem is the lack of resources to finance adequate equipment. The problem is similar in the smaller laboratories in the districts. During project preparation the needs in laboratory equipment were analyzed and the results are shown in Table 3. The cost of these needs amounts to about US\$400,000 equivalent, of which the proposed Project will finance US\$250,000.

EXISTING AND REQUIRED TRAFFIC COUNTERS

DISTRICT	E x i s t i n g			Required	Total
	Pneumatic	Magnetic	Total		
La Paz	7	7	14	27	41
Chuquisaca	4	-	4	18	22
Tarija	3	3	6	18	24
Cochabamba	6	4	10	20	30
Santa Cruz	3	4	7	27	34
Oruro	3	2	5	14	19
Potosi	3	-	3	13	16
Tupiza	1	-	1	3	4
Beni	3	-	3	6	9
Pando	1	-	1	-	1
	33	20	54	146	200

TRAFFIC COUNTERS AND ADDITIONAL EQUIPMENT
(US\$)

I T E M	Units	Unit Cost	Total Cost
Traffic Counters	164	2380	390,320
Spare Parts for New Counters (10%)			39,000
Spare Parts for Existing Counters			7,500
Control Panel	20	560	11,200
Switches	30	90	2,700
Relays	30	40	1,200
Clutch Keys	50	2.8	140
Tape Ratchets	30	45	1,350
Print Wheels	60	25	1,500
Drive Motors	20	290	5,800
Ink Cartridges	100	45	4,500
Detectors	65	500	32,500
Tape Optical Reader	1	2000	2,000
TOTAL			499,710

ANNEX 7
Table 3

SOILS, CONCRETE, ASPHALT LABS EQUIPMENT

I T E M	C O S T
<u>Central Lab:</u>	
Equipment for triaxial test, consolidation, drilling, screens, thermometers, dynamometric, rings, etc.	47,700
<u>Concrete Equipment</u>	
Corecutter, winds reset test, portable mixer, moulds, flasks, etc.	35,600
<u>Asphalt Equipment</u>	
Marshall equipment, compressor for compaction unit, viscosimeter, compacting equipment, thermometers, receptacles, etc.	23,600
2 Troxler equipment: to determine soils density, asphalt mixes and c.a. % (percentage)	62,000 (*)
<u>Geology Equipment</u>	
Stereoscopic, pantograph, compass, hammers to make borings, camping tents and complementary equipment	6,100
<u>Labs for the Districts:</u>	
Two soil and concrete equipment for Beni and Pando	128,000 (*)
Complete asphalt lab, to work in Chuquisaca, and districts	51,290 (*)
Failure presses, capping equipment, CBR equipment, dynamometric rings, etc. to complete the labs, of the SNC districts.	53,500

T O T A L	407,790

(*) C.I.F. SNC warehouse

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Road Safety Program

1. The number of accidents on the road network is high, particularly if it is compared with the number of vehicles and the average medium traffic of the network. One of the causes of accidents is the lack of adequate vertical signalization and safety barriers. This problem is more acute in the gravel network (26.2% of the total), which totally lacks of any signs and safety barriers. The contracts for periodic maintenance financed by this Project will include signs and marks for the roads included in the program, but, for the rest, additional funds are necessary to improve the present situation. The proposed Project will finance a Road Safety Program on road signs, safety barriers and scope protection (detailed in Table 1) with a total cost of about US\$1.6 million (the Project includes US\$1.1 million for financing this program).

V-B

SAFETY PROGRAM

1992 - 1995

TYPE OF HIGHWAY	LENTH (KM)			VERTICAL SIGNALS		BARRIERS		SLOPE PROTECTION	
	PAVED	UNPAVED	TOTAL	SIGNALS	COST US\$	LENGTH (M)	COST US\$	SURFACE (M2)	COST US\$
1st Yr. Program 1992									
Main Trunk Roads	228	968	1196	890	115,344	2265	193,884	10000	50,000
Regional Trunk Roads	--	326	326	250	34,400	380	32,528	--	0
Rural Roads	--	22	22	25	3,240	30	2,568	--	0
TOTALS (1992)	228	1316	1544	1165	150,984	2675	228,980	10000	50,000
TOTAL 1992 Program:	US\$ 429,964								
2nd Yr. Program 1993									
Main Trunk Roads	70	1054	1124	860	111,456	1465	125,404	10000	50,000
Regional Trunk Roads	--	253	253	238	30,844	350	29,960	--	0
Rural Roads	--	89	89	70	9,072	160	13,696	--	0
TOTALS (1993)	70	1396	1466	1168	151,372	1975	169,060	10000	50,000
TOTAL 1993 Program:	US\$ 370,432								
3rd Yr. Program 1994									
Main Trunk Roads	282	827	1109	710	92,016	2140	183,184	20000	100,000
Regional Trunk Roads	--	310	310	290	37,584	300	25,680	--	0
Rural Roads	--	--	--	--	0	--	0	--	0
TOTALS (1994)	282	1137	1419	1000	129,600	2440	208,864	20000	100,000
TOTAL 1994 Program:	US\$ 438,464								
4th Yr. Program 1995									
Main Trunk Roads	--	105	105	60	7,776	120	10,272	5000	25,000
Regional Trunk Roads	--	499	499	500	64,800	1050	89,880	--	--
Rural Roads	40	571	611	550	71,280	990	84,744	--	--
TOTALS (1995)	40	1175	1215	1110	143,856	2160	184,896	5000	25,000
TOTAL 1995 Program:	US\$ 353,752								
TOTAL NEEDS (1992-95)	620	5024	5644	4443	575,812	9250	791,812	45000	225,000
TOTAL 1992-1995 Program	US\$ 1,592,612								

B O L I V I A

SECOND ROAD MAINTENANCE PROJECT

Implementation of the SAM and the SAE in the DDVs
Terms of Reference

Background

1. The 1587-BO project, financed by IDA, provided technical assistance to SNC to prepare and develop the SAM, a maintenance management system and the SAE, an equipment management system, and some training was also provided especially for equipment management and workshop organization. However, a detailed work program was never implemented. In 1989, SNC started the implementation of the SAM and the SAE in the five districts under CAF (Confederacion Andina de Fomento) financing and is now implementing the SAM and the SAE in the other five districts, under the Export Corridors Project. The systems will require additional updating data, concerning effective work force for maintenance activities, list of equipment and condition, and highway inventory by physical characteristics. After completion of their implementation in January 1992, the SAM and the SAE will provide the means to improve the SNC maintenance budget process. This technical assistance will assist in the extension, to the future DDVs, of these systems at the departmental level and in the field, within the process of decentralization from SNC to the DDVs. They will then be used as the basis for determining future road maintenance budgets.

Objectives

2. The main objective of this technical assistance is to strengthen the technical and administrative capacity of the future Road Department Directorates (DDVs), including assistance in the organization during and after the probable transfers to these new DDVs. This technical assistance will also include: (i) implementation of the SAM and the SAE in the new DDVs; (ii) training DDV's staff in the application of the systems; (iii) study of the needs in human, physical and financial resources for SNC and the new DDVs; and (iv) organization and use of the resources after the decentralization.

Scope of assistance

3. The principal tasks to be performed by this technical assistance are the following:

- (a) reviewing, updating and adapting, to the needs of the DDVs, the existing road and equipment management systems in SNC;
- (b) revising the available elements and collecting the information required to implement the systems;

- (c) implementing the SAM in the DDVs;
- (d) implementing the SAE in the DDVs;
- (e) implementing a computerized analysis of the systems in the DDVs;
- (f) applying cost accounting to road maintenance;
- (g) preparing the DDV maintenance program and its budget using the implemented systems;
- (h) formulating a program for maintenance by contract in the DDVs; and
- (i) personnel training in the DDVs.

4. The first task will consist of reviewing the adaptability of the systems implemented in the SNC, at a central level and in the districts, to the new DDVs. After this analysis, the consultant will adapt the system to the DDVs. In this phase, the consultant will determine maintenance activities, quantity of works, maintenance levels, performance standards and the costs to be used in the SAM, based on the experience of the implementation of the system in the SNC districts.

5. The second task will include the programs for collecting road roughness data (using the Mays Road Meter) and deflections (with the Falling Weight Deflectometer) and other data needed to use the HDM-III model. This task will also include identification, evaluation and selection of sources of materials for road maintenance, including the analysis of problems concerning development of borrow pits, transportation of materials and possible environmental impact.

6. The third task, (implementation of the SAM) will aim at strengthening DDV's technical and administrative capabilities, setting up the procedures for planning, budgeting and monitoring road maintenance programs. The system will be implemented, at the DDV's offices and in the field, considering routine, periodic and improvement maintenance. The SAM will allow to organize the DDVs to carry out the road maintenance programs. The implementation of the system at the field level will allow the DDV field offices to prepare and monitor its monthly road maintenance programs.

7. As fourth task, the consultant will adapt and implement the SAE in the DDVs. First, the consultant will collect and analyze data on the availability and use of SNC's transferred equipment fleet. He will also: (i) analyze the outputs and operating cost of the DDVs' equipment and will update the existing equipment inventory; (ii) evaluate SNC's programs and policies on equipment management, preventive maintenance levels and workshops management, in order to adapt them to the DDVs; (iii) analyze the procedures in equipment control, including forms and reports currently used; by SNC; (iv) evaluate the procedures used by SNC to obtain equipment operating and maintenance costs and will adapt them to the DDVs; (v) analyze and evaluate the control procedures for spare parts including stocks and inventories and adapt them to the DDVs; and (vi) recommend the policies and procedures to be followed in the future by the DDVs.

8. The fifth task will be the implementation of computerized analysis of the management systems. The consultant will prepare and implement: (i) computerized programs for planning, budgeting and monitoring the road equipment maintenance programs in the DDVs; and (ii) analysis and assessment of maintenance policies using mathematical models for short, medium and long term.

9. The sixth task will be the application of the cost accounting to road maintenance based on the experience of SNC at the central level and in the districts. The main objective of this task is setting up a cost accounting system to support the SAM and the SAE and introducing reliable procedures to monitor the DDVs' payments and expenditures according to work progress.

10. The seventh task will be the preparation of a detailed DDV maintenance program and its budget for the two following years, taking into account the experience of SNC with the CAF program in the southern districts and with the National Road Maintenance Program in the northern districts. This DDV maintenance program will be prepared based on the previously implemented maintenance, equipment and computer systems. It will be started in the last phase of the technical assistance and include assistance to the DDVs by the consultant in implementing the program and preparing the appropriate documents for government approval.

11. The eight task will be the formulation of a program to carry out maintenance by contract for the first two years of the implementation of the systems. The consultants, will select the works to be contracted starting from the maintenance program for the period and will prepare bidding documents for the procurement of contractor services. They will also group the works in lots whose size will be attractive to local contractors, in function of their equipment and working capital.

12. The ninth task will be personnel training. The consultant will: (i) assess the DDV's minimum needs in training specialists; (ii) assess and update the personnel directly involved in maintenance activities, in their central offices and in the field by category; (iii) prepare and carry out a training plan for technical and administrative personnel involved in maintenance planning, execution and control; (iv) set up a system of evaluation and control of the training programs; and, (v) prepare a study of DDV's personnel needs at their central offices and in the field, based on the maintenance programs.

Staffing and Cost

13. The technical assistance will be provided by the following specialists:

- a) A highway engineer, with experience in maintenance and equipment management systems, maintenance by contract and maintenance planning and budgeting, who will be the program leader and coordinator. (24 months)
- b) An equipment specialist, with experience in equipment management systems. (18 months)

- c) A computer system analyst. (12 months)
- d) A specialist in maintenance cost accounting. (9 months)
- e) A personnel training specialist. (12 months)

14. It is envisaged that this technical assistance will be carried out over a period of two years and will require a total of 75 man-months. All staff must be fluent in Spanish. The cost of this technical assistance, financed by this project, will be US\$1 million.

Executing Government Agency and Counterpart Staff

15. SNC will be the technical assistance executing agency. The counterpart staff will be selected by SNC from permanent staff at the DDV's central offices and in the field.

Schedule and Reports

16. By the first month, the Consultant will submit an initial program with the activities to be carried out in the term established by the contract (24 months). This program will consist of, but not necessarily be limited to, the following:

- a) analysis and evaluation of the existing situation;
- b) implementation of the technical assistance in accordance with the initial program approved by SNC and the DDVs;
- c) monitoring of the first maintenance programs and preparation of the following maintenance programs and budgets; and
- d) monitoring of the systems implemented.

17. In addition to the initial program, the consultant will submit quarterly reports to the SNC Director General and the DDV directors, during the period in which services are rendered, and a final report by the date on which the contract ends.

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Terms of Reference for a Study of the Road Construction Industry

1. Objectives

The objectives of this study are to identify the main constraints and obstacles preventing the domestic construction industry of Bolivia from assuming a more effective role in the country's road construction and maintenance programs and to develop appropriate detailed plans of action to overcome those constraints.

The work process should be to undertake a brief but balanced and careful overview, and then to focus on the main issues on which action is needed. Most of the effort of the study will, thus, be devoted to identifying and considering alternative, viable solutions to the problems and to working up action plans for their implementation.

To ensure full commitment of the Government and of the industry to the execution of the strategy and action plans, they should be developed in close collaboration with the Ministry of Transport and Communications, acting liaison agency for the study team, and with the construction industry's representatives and professional associations.

2. Scope of the Study

The study of the construction industry and the formulation of a strategy and action plans will be based on a careful consideration of the following subjects: i) structure of the industry; ii) demand; iii) procurement and contract administration; iv) choice of technology; v) the industry's capacity; vi) financing; vii) legal aspects; and viii) institutional aspects

2.1 Structure of the Industry

- (a) Historical development of the industry including emergence of entrepreneurs and ownership characteristics of construction enterprises.
- (b) Participation of the industry in the economy of the country including contribution to employment, backward and forward linkages, particularly with the construction materials industry, and comparison with developed countries and with countries at a similar stage of development.
- (c) Participation of the main sectors of the industry in the satisfaction of the overall demand for construction and maintenance services; historical participation, and future trends.

- (d) Experience with joint ventures and domestic sub-contractors of foreign firms.

2.2 Demand

- (a) Overall demand: historical series, fluctuation of annual growth rates relative to the manufacturing industry and GDP and identification of trends.
- (b) Implications of the program for decentralization of the transport sector on the future demand for construction services, at both national and regional levels.
- (c) Forecast future demand, identifying, in particular:
 - (i) Recurring demand for construction and maintenance services which can potentially be supplied by the domestic private sector;
 - (ii) Recurring demand for construction and maintenance services which would preferably be catered for by force account operations; and
 - (iii) Demand for larger construction works which can be handled by domestic enterprises, either by slicing and packaging or by providing those enterprises with technical and financial assistance.

2.3 Procurement and Contract Administration

- (a) Procedures for procurement in the public and private sectors; regulations for bidding and negotiating construction and maintenance work; existence and adequacy of contractor's registry; time consumed and difficulties encountered in the post-bid process, up to the start of work.
- (b) Contract forms and contracting practice; fairness of contract provisions, particularly in the apportionment of risk between owner and contractor; compensation to the contractor for default by the owner (for example interest payable for late progress payments, or compensation for delays induced by the owner); adequacy of provisions for price escalation and settlement of disputes; existence of indices or data sources for applying escalation provisions.
- (c) Policy and legal framework for contracting with government agencies.
- (d) Capacity of government agencies to manage contracts and supervise construction; autonomy of government supervisors; adequacy of consultants employed for supervision; restrictions which may inhibit the engagement of competent supervisors.

- (e) Adequacy of the engineering preparation of works in relation to the level of development of the domestic construction industry.
- (f) Anomalies and difficulties observed in the process of procurement, management, and completion of construction contracts.

2.4 Choice of Technology

- (a) Potential for the employment of alternative technologies in construction.
- (b) Pricing distortions which may influence choice against locally available, traditional construction materials.

2.5 The Industry

- (a) Level of development of civil construction sectors, according to specified indicators of complexity and volume of the operations the domestic enterprises can handle.
- (b) Ownership and organization of construction enterprises state and private, and problems and constraints of each, in particular efficiency of each type of organization.
- (c) Entrepreneurs and managers: their status in society; potential supply of entrepreneurs and managers; traditional attitudes; willingness of leaders to learn modern management techniques; facilities available for coaching entrepreneurs and managers; salary levels.
- (d) Supply of engineers, architects, estimators, surveyors, accountants, senior clerks, foremen, and other middle-level managers; traditional sources, adequacy of supply, and training facilities available; salary levels.
- (e) Supply of equipment operators and mechanics; adequacy of supply and training facilities available; proficiency levels relative to the quality of finished work; wage levels.
- (f) Adequacy of salary and wage regimes for state and private construction enterprises; problems arising from these regimes.
- (g) Labor productivity and feasible incentives.
- (h) Equipment resources: restrictions for the importation and ownership of construction equipment; standardization; availability of spare parts and servicing facilities; restrictions on the importation of spare parts; availability of excess equipment in government fleets which could be sold or hired out to contracting enterprises; prices of consumable.
- (i) Availability of materials: shortage which affect construction; alternatives available; means of marketing and distribution,

accessibility of self-help builders; prices of domestic and imported materials.

- (j) Technology gaps in estimating, planning, organizing and managing construction work, cost control, and construction technology; quality of finished work.
- (k) Research and development facilities available for the industry; identification of needs.

2.6 Financing

- (a) Financing, bonding, guarantee and insurance requirements of builders and civil contractors.
- (b) Perception of the industry by domestic financiers, bondsmen, and insurers. Financial indicators which confirm or do not confirm this perception.
- (c) Particular characteristics of construction risk in Bolivia.
- (d) Availability of credit for the industry from commercial banks, DFCs, non-banking sources, suppliers' credit. Terms and conditions on which credit, bonds, and guarantees are advanced to the industry. Capability of the industry to meet those terms and conditions.
- (e) Availability of suitable insurance facilities.
- (f) Suitability of contractual arrangements (advances or progress payments) in the context of the financial resources available to the industry. Acceptance by financiers of government progress certificates and other contractual documents for discounting. Terms of such discounting.
- (g) Participation of the private sector in public works financing, through concessions, build-operate-transfer systems of others and potential under the regulatory framework created by the government's policies on decentralization of the transport sector.

2.7 Legal

- (a) Taxation regime applicable to the construction industry. Tax exemptions and concessions (particularly, incentives for re-investment), depreciation allowances. Protection of industry against foreign competition. Pricing and profit controls.
- (b) Employment regime. Permanence of labor in construction industry employment. Wage-fixing procedures, free bargaining. Social laws (health, insurance, pension, and so forth) applicable to construction. Methods available for settlement of disputes. History of periodicity of disputes.

- (c) Importation regime. Duties or quotas levied on equipment, spare parts, and materials. Treatment of domestic and foreign companies. Restriction in the availability of foreign currency.
- (d) Company and ownership laws applicable to the industry.
- (e) Codes and regulations affecting the industry (for instance, licensing of contractors, determination and limitations of responsibility, building codes, safety and fire regulations).

2.8 Institutional

- (a) Existence of a government office responsible for development of the industry and for liaising with industry institutions.
- (b) Existence of an institution representative of the industry, capable of presenting its views to the Government in matters affecting construction and providing management information and training services to construction enterprises.
- (c) Existence of professional associations related to the construction activity (for engineers and architects, for example).

3. Strategy and Action Plans

A comprehensive strategy for development of the industry will be prepared, to enhance the level of development of the industry. The strategy will propose short-, medium-, and long-term objectives. These shall take into account the state of development of the country's economy and its likely evolution when proposing a time frame.

A small number of action plans, aimed at resolving key problems and constraints identified in the strategy as having a high priority will be prepared. The plans will contain schedules and programs for their implementation, the persons or institutions responsible, the estimated costs and likely sources of funding, and the standards by which to appraise the results of these programs.

4. Staffing

The study will be carried out over a period of 8 months by the following professionals:

- i) a highway engineer, experienced in identifying construction industry problems and contract administration, who will be the project leader (8 months);
- ii) a financial analyst, experienced in fiscal policies and legislation (4 months); and
- iii) a lawyer, experienced in construction legislation, tax reform and public management (4 months).

5. Executing Agency

SNC's Planning Department will supervise the study and will assign a coordinator to follow up the progress of the study and coordinate discussions between the consultants and the institutions involved in the road construction industry.

6. Schedule and Reports

The study will start in early 1993. The consultant will submit a final report, summarizing the main findings of the study and the action plans recommended. The consultants will furnish to SNC a preliminary version of this self-contained report by the end of the seventh month and will issue the revised version, approved by SNC, by December 31, 1993.

BOLIVIA

SECOND ROAD MAINTENANCE

TRAINING

SNC's operational efficiency can be improved only with qualified personnel. An assessment of the needs in personnel will be one of the main objectives of SNC. This objective will be accomplished by executing the different courses, seminars and scholarships programmed by SNC for its personnel.

Furthermore, the implementation of Suticollos's Training School will become a very useful tool to improve staff's productivity and efficiency at every level by means of the following programmed courses:

I. National and local courses (88 programmed courses)

1.	51 courses by instructors of the Training School (see Table 1)	US\$	90.000
2.	19 courses to SNC personnel by contracted national instructors (see Table 1)	US\$	60.000
3.	18 courses by contracted foreign instructors (see Table 1)	US\$	100.000
4.	Cost equipment for implementation of the above courses (see Table 2.1)	US\$	40.000
5.	Cost of training materials to be used in the of courses, brochures and publications (see Table 2.2)	US\$	<u>10.000</u>
	Sub Total	US\$	300.000

II. Registration for courses, seminars, and per diem abroad (Including tickets) SNC.

1.	Attendance of 5 professionals to specialized courses abroad, 3 months each	US\$	44.000
2.	Travel abroad of 6 Bolivian professionals, 1 month each	US\$	36.000
3.	Visits to institutions abroad for professionals, 1 month each	US\$	40.000
4.	Scholarships abroad for 2 instructors of the Training Division, 1 year each	US\$	<u>80.000</u>
	Sub Total	US\$	200.000

FINAL TOTAL COST OF THE TRAINING PROGRAM

I.	National and local courses (88 courses)	US\$	300.000
II.	Courses, seminars and scholarships abroad	US\$	<u>200.000</u>
	Total cost	US\$	500.000

SOLOVIA
SECOND ROAD MAINTENANCE PROGRAM
TRAINING

No	COURSE	ATTENDANTS	AREA	[No of] [DAYS]	[Lecturer]	DATE	COST
1	PUBLIC RELATIONS	TECHNICAL AND ADMINIST. STAFF	ADMINIST.	45 5 L.P2.	NATIONAL CONSULTANT	01.13.92	2,500.00
2	METROLOGY I - II	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	02.13.92	2,383.00
3	METROLOGY I - II	WORKSHOP PERSONNEL	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	02.24.92	2,383.00
4	METROLOGY I - II	MAN. OF GOODS AND STAKE PATTS	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	03.16.92	2,383.00
5	ENGINE OVERHAUL	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	04.13.92	3,000.00
6	TIRMO CHARGERS	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	05.04.92	3,000.00
7	INJECTION SYSTEMS	MECHANICS AND ASSIST.	MECHANICAL	25 10 L.P2.	FOREIGN CONSULTANT	05.25.92	4,500.00
8	ENGINE'S INSPECTION	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	NATIONAL CONSULTANT	06.22.92	2,000.00
9	COOLING SYSTEM	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	07.20.92	3,000.00
10	LUBRICATION SYSTEM	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	08.17.92	3,000.00
11	ENGINE PARTS INSPECT	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	09.07.92	3,000.00
12	ENGINE TUNE UP	MECHANICS AND ASSIST.	MECHANICAL	20 5 L.P2.	NATIONAL CONSULTANT	09.08.92	2,000.00
13	MANUAL SHIFTING	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	NATIONAL CONSULTANT	10.19.92	2,000.00
14	MOTOR SYSTEMS	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	NATIONAL CONSULTANT	11.09.92	2,000.00
15	DIFFERENTIAL SYSTEM	MECHANICS AND ASSIST.	MECHANICAL	30 5 L.P2.	NATIONAL CONSULTANT	11.30.92	2,000.00
16	CORE LAMBE	WORKSHOP PERSONNEL	MECHANICAL	30 5 L.P2.	TRAINING DIVISION (SRC)	12.14.92	3,500.00
17	SCISSOR CUTTING LAMBE	WORKSHOP PERSONNEL	MECHANICAL	30 10 L.P2.	TRAINING DIVISION (SRC)	01.18.93	3,500.00
18	MILLING OPERATION	WORKSHOP PERSONNEL	MECHANICAL	30 10 L.P2.	TRAINING DIVISION (SRC)	02.08.93	3,500.00
19	JARC WELDING	WORKSHOP PERSONNEL	MECHANICAL	30 10 L.P2.	TRAINING DIVISION (SRC)	03.01.93	3,500.00
20	OXIGEN WELDING	WORKSHOP PERSONNEL	MECHANICAL	30 10 L.P2.	TRAINING DIVISION (SRC)	04.22.93	3,500.00
21	WARE	WORKSHOP PERSONNEL	MECHANICAL	45 5 L.P2.	TRAINING DIVISION (SRC)	04.12.93	3,000.00
22	WARE	WORKSHOP PERSONNEL	MECHANICAL	45 5 L.P2.	TRAINING DIVISION (SRC)	05.03.93	3,000.00
23	SOWAYSTON AND CONTROL	TECHNICAL AND ADM. STAFF	MECHANICAL	45 5 L.P2.	FOREIGN CONSULTANT	05.24.93	4,000.00
24	INDUSTRIAL SAFETY	TECHNICAL STAFF	MECHANICAL	45 5 L.P2.	TRAINING DIVISION (SRC)	06.14.93	2,500.00
25	INDUSTRIAL SAFETY	WORKSHOP PERSONNEL	MECHANICAL	45 5 L.P2.	TRAINING DIVISION (SRC)	07.03.93	2,500.00
26	SECRETARIAL	ADMINIST. DISTRICT STAFF	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	08.07.93	2,500.00
27	SECRETARIAL	ADMINIST. DISTRICT STAFF	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	08.16.93	3,000.00
28	CIVIL PROJECT EVALUATION	CIVIL ENGINEERS	CIVIL	45 10 L.P2.	NATIONAL CONSULTANT	09.06.93	4,000.00
29	GENERAL PROJECT EVALUATION	TECHNICAL AND ADM. PERSONNEL	CIVIL	45 10 L.P2.	NATIONAL CONSULTANT	09.27.93	4,000.00
30	COSTS AND DECISION MAKING	MIDDLE MANAGEMENT	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	10.10.93	4,000.00
31	ADVANCED MANAGEMENT	UPPER MANAGEMENT	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	11.09.93	4,500.00
32	ADMINISTRATIVE	ADMINIST. AND AUDITING STAFF	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	11.29.93	4,500.00
33	ACCOUNTING	ADMINIST. AND AUDITING STAFF	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	12.20.93	4,500.00
34	FORECASTS AND DELIVERIES	ADMIN. AND AUDITING STAFF	ADMINIST.	45 10 L.P2.	NATIONAL CONSULTANT	01.10.94	4,500.00
35	CONCRETE ASPHALT PLANT INSPECTION	PIEL ENGINEERS AND SUPP. STAFF	CIVIL	45 5 L.P2.	FOREIGN CONSULTANT	01.31.94	6,000.00
36	CONCRETE ASPHALT PAVEMENT	FIELD ENGINEERS AND SUPP. STAFF	CIVIL	49 5 L.P2.	FOREIGN CONSULTANT	02.21.94	5,500.00
37	BITUMINOUS MATERIAL INSPECTION	FIELD ENGINEERS AND SUPP. STAFF	CIVIL	45 5 L.P2.	FOREIGN CONSULTANT	03.13.94	6,000.00

ANNEX 11
Table 1 (ii)

No	COURSE	ATTENDANTS	AREA	No OP DURAT			LECTURER	DATE	COST
				ATT.	DAYS	PLACE			
38	PAVEMENT RECYCLING INSPECTION	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	04.04.94	6,000.00	
39	CONCRETE PAVEMENT INSPECTION	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	04.25.94	6,000.00	
40	STRUCTURAL WORKS INSPECTION	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	05.16.94	6,000.00	
41	CONCRETE STRUCTURES INSPECTION	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	06.06.94	5,000.00	
42	ANALYTICAL VERIFI- CATION OF CONCRETE	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	06.27.94	6,000.00	
43	ROAD RESEALING INSP.	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	07.18.94	6,000.00	
44	SIMPLE AND MULTIPLE ASPHALTS	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	08.08.94	5,000.00	
45	BASIC SURVEYING	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	10	LPZ. TRAINING DIVISION SNC	08.29.94	4,500.00	
46	ADVANCED SURVEYING	FIELD ENGINEERS AND SUPP.STAFF	CIVIL	45	10	LPZ. TRAINING DIVISION SNC	09.19.94	4,500.00	
47	CONCRETE ADITIVES	CIVIL ENGINEERS	CIVIL	45	5	LPZ. NATIONAL CONSULTANT	10.10.94	3,500.00	
48	CLEARING AND BRUSHING OF BRIDGES	CIVIL ENGINEERS	CIVIL	45	5	LPZ. NATIONAL CONSULTANT	10.31.94	3,500.00	
49	COMPUTERIZET HIGHWAY DESIGN	CIVIL ENGINEERS	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	11.21.94	6,000.00	
50	HIGHWAYS - BASIC	CIVIL ENGINEERS	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	12.12.94	6,500.00	
51	ADVANCED HIGHWAY SOLLS	CIVIL ENGINEERS	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	01.16.94	6,500.00	
52	MAINTENANCE PROBLEMS	CIVIL ENGINEERS	CIVIL	15	1	DIST. TRAINING DIVISION SNC	02.27.95	900.00	
53	ASPHALT CRACKS REPAIR	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST. TRAINING DIVISION SNC	03.20.95	900.00	
54	BASE AND SUBBASE REPAIR	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST. TRAINING DIVISION SNC	04.10.95	900.00	
55	ASPHALT PATCHING REPAIR	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST. TRAINING DIVISION SNC	01.05.95	900.00	
56	RELEVELING	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST. TRAINING DIVISION SNC	05.2.95	900.00	
57	MOTOR GRADER OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	4	DIST. TRAINING DIVISION SNC	06.12.95	1,500.00	
58	ARTICULATE MOTOR- GRADE OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	2	DIST. TRAINING DIVISION SNC	07.17.95	1,000.00	
59	FRONT LOADERS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	2	DIST. TRAINING DIVISION SNC	08.14.95	1,500.00	
60	COMPACTORS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	4	DIST. TRAINING DIVISION SNC	09.18.95	1,500.00	
61	TRACTOR OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	4	DIST. TRAINING DIVISION SNC	10.16.95	1,500.00	
62	WELDED JOINTS	CIVIL AND MECHANICAL ENGINEERS	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	11.13.95	6,000.00	
63	ROADS PHYSICAL CHARACTERISTICS	CIVIL ENGINEERS	CIVIL	45	5	LPZ. FOREIGN CONSULTANT	12.11.95	6,000.00	
64	CRUSHERS OPERATION	EQUIPMENT OPERATIONS AND ASSIS	CIVIL	15	2	DIST. FOREIGN CONSULTANT	07.12.92	900.00	
65	ASPHALT DISTRIBUTOR	EQUIPMENT OPERATORS	CIVIL	5	1	DIST. TRAINING DIVISION SNC	04.06.92	3,000.00	
66	ASPHALT DISTRIBUTOR DAILY MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	CIVIL	5	1	DIST. TRAINING DIVISION SNC	06.01.92	551.00	

ANNEX 11
Table 1 (iii)

No	COURSE	ATTENDANTS	AREA	[No OF DURAT			LECTURER	DATE	COST
				ATT.	DAYS	PLACE			
67	MOTORGRAIDER DAILY MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	MECHANICAL	15	1	DIST.	TRAINING DIVISION SNC	07.227.92	900.00
68	FRONT LOADER DAILY MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	MECHANICAL	15	1	DIST.	TRAINING DIVISION SNC	09-21-92	900.00
69	COMPACTOR DAILY MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	MECHANICAL	15	1	DIST.	TRAINING DIVISION SNC	11.16.92	900.00
70	DUMP TRUCKS DAILY MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	MECHANICAL	15	1	DIST.	TRAINING DIVISION SNC	01.11.93	900.00
71	TRACTOR DAILY MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	MECHANICAL	15	1	DIST.	TRAINING DIVISION SNC	03.08.93	900.00
72	LIGHT VEHICLES MAINTENANCE	EQUIPMENT OPERATORS AND ASSIS.	MECHANICAL	15	1	DIST.	TRAINING DIVISION SNC	05.10.93	900.00
73	CONCRETE ASPHALT PATCHING REPAIR	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	07.12.93	900.00
74	TRAFFIC CONTROL MAINTENANCE	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	08.30.93	900.00
75	COMMON MAINTENANCE PROBLEMS	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	10.11.93	900.00
76	ASPHALT PAVEMENT CRACKS	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	12.06.93	900.00
77	BASE AND SUBBASE REPAIR	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	02.28.94	900.00
78	BITUMINOSES ASPHALT PATCHING REPAIR	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	04.18.94	900.00
79	RELEVELING	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	06.13.94	900.00
80	MOTORGRADERS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	08.15.94	1,500.00
81	ARTICULATE MOTOR- GRADERS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	10.17.94	1,000.00
82	FRONT LOADERS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	12.05.94	1,500.00
83	COMPACTORS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	4	DIST.	TRAINING DIVISION SNC	02.13.95	1,500.00
84	TRACTORS OPERATION	PIEL ENGINEERS AND SUPP.STAFF	CIVIL	15	4	DIST.	TRAINING DIVISION SNC	04.03.95	1,500.00
85	DUMP TRUCKS OPERATION	ASSISTANT DRIVERS	CIVIL	15	2	DIST.	TRAINING DIVISION SNC	05.29.95	1,000.00
86	RELEVELING AND LEVELING OF RDS	EQUIPMENT OPERATORS AND ASSIST	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	07.24.95	900.00
87	CLEANING OF DITCHES	EQUIPMENT OPERATORS AND ASSIST	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	18.09.95	900.00
88	REGRAVELLING	EQUIPMENT OPERATORS AND ASSIST	CIVIL	15	1	DIST.	TRAINING DIVISION SNC	10.20.95	900.00

	TOTAL								250,000.00

2.1 COST OF EQUIPMENT FOR TRAINING COURSES

<u>UNITS</u>	<u>I T E M</u>	<u>\$US.</u>
1	Printer.....	900
1	Color Microcomputer.....	5.700
1	Photocopier.....	9.500
1	Professional Portable Video Camera.....	2.500
1	Editing Equipment (Movies and Video).....	7.700
1	Data Show.....	3.000
2	Acrylic Boards (2x1.30mts.) and Markers.....	500
1	Color Portable Microcomputer.....	4.500
4	Transparent Projectors.....	2.500
4	Screens (3x2.5mts.) with tripod...	<u>3.200</u>
SUB TOTAL	\$US.....	40.000

2.2 COST OF MATERIALS FOR TRAINING ACTIVITIES

<u>UNITS</u>	<u>I T E M</u>	<u>\$US.</u>
1	Photocopier Paper.....	1.750
1	Computer Paper.....	1.750
1	Cassettes for VHS and Beta.....	1.500
1	Covers for Texts.....	500
1	Office Supplies.....	1.000
1	Computer Diskettes.....	1.000
1	Computer Ribbons.....	500
1	Computer Diskettes Protectors.....	500
1	Electric Power Regulators.....	<u>1.500</u>
SUB TOTAL	\$US.....	10.000

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Economic Evaluation

Project components evaluated

1. An economic evaluation was made of 64 sub-projects to improve the condition of the roads included in the periodic maintenance component of the loan. The paved network sub-projects finally included in the Project have a total length of 781 km, a base financial cost of US\$42.6 million and an economic rate of return of 36.6%. The only paved links excluded from the evaluation were those sections of road which have had a reconstruction project in the last three years, such as the La Paz - Oruro road currently being reconstructed with finance from the Export Corridors Project. The gravel network component has total length of 765 km, a base financial cost of US\$17.5 million and an economic rate of return of 45.0%. The economic rate of return for the periodic maintenance component as a whole is 39.2%. This component of the project accounts for 72% of the total investment funds and 58% of the IDA component of the project.

2. The equipment rehabilitation program (US\$3.0 million) was also subject to an economic evaluation. This component of the project will extend the economic life of each unit of equipment and postpone purchases of new equipment. The rehabilitation cost of each unit of equipment does not exceed 40% of its replacement cost, with the average cost at 25%, which yields an average economic return of 42%.

3. The principal benefit of the project is a reduction in vehicle operating cost (about 70% of total benefits), with reduced future highway maintenance and reconstruction costs as an important secondary benefit (accounting for about 15% of the total). Savings in car and bus passenger time costs account for the remaining 15% of the total benefits. The evaluation results are summarized in the following Table, and provided for each link in Tables 1 (paved network) and 2 (gravel network):

	Units	Paved Network	Gravel Network	Total project
Length of roads included	km	781	765	1,546
Number of road links		32	28	60
Financial cost	US\$ m	42.65	17.87	60.52
Economic cost	US\$ m	36.90	16.81	53.71
Financial cost per km	US\$	54,961	22,827	39,044
Economic rate of return (ERR)	%	36.6	45.0	39.2
ERR with 25% extra cost	%	30.6	34.6	31.8
ERR with zero passenger time	%	33.0	38.9	34.7

Method of evaluation

4. The economic analysis of the periodic maintenance component was carried out using the Highway Design and Maintenance Model. The sections to be rehabilitated were divided into links which were considered homogeneous in terms of traffic levels and physical condition. For each link, traffic was projected based on historical trends and expected population and production growth in the region. The overall traffic growth rate adopted for the economic evaluation was the lower of the rate calculated using information specific to the locality of the road and the historic average growth rate.

5. Estimates of the investment costs for both periodic maintenance components were based on engineering studies for overlays, surface improvements, sealing and regravelling. Using engineering data and climatic and geographic data, as well as traffic characteristics and cost parameters, the model simulated the operating conditions for each link and calculated total vehicle operating and highway maintenance costs for the situations with and without the proposed sub-project.

Alternatives evaluated

6. The following options were examined by the model in 842 km. of the paved network:

- (i) routine maintenance only;
- (ii) sealing of 10 mm. (only for roads with asphalt concrete);
- (iii) double surface treatment of 20 mm; and,
- (iv) asphalt concrete overlay of 50 mm.

Four components of post-project routine maintenance were considered for each section of paved road evaluated:

- (i) patching;
- (ii) resealing;
- (iii) patching and resealing; and
- (iv) routine maintenance.

7. A separate analysis was conducted for 925 km of the gravel roads. The evaluated project was similar in all cases, provision of a new surface of 150 mm. of gravel, with associated complementary works such as construction of retaining walls, provision of drainage, etc. Four components of post project routine maintenance were considered for each section of road evaluated:

- (i) replacement of between 5 and 50 m³/km/year of gravel;
- (ii) grading at intervals determined by the volume of traffic, between once every 15 and 90 days;
- (iii) replacement of the surface with 100/150 mm. of new gravel at intervals also determined by the volume of traffic; and
- (iv) routine maintenance.

8. The Highway Design Model is designed to recommend the solution which minimizes the net present value of the costs associated with each solution

including investment and maintenance costs and vehicle operating costs. The higher the traffic level, the more rapid is the deterioration in road condition and the more likely is a higher-cost investment alternative. The analysis resulted in the solutions recommended in the following paragraph.

Evaluation results

9. Of the 1,767 km of road analyzed, 221 km merit only routine maintenance because the low actual and projected traffic do not produce sufficient benefits to justify the investment. These sections of road were therefore excluded from the Project. Of the remaining 1,546 km included in the Project:

- 186 km justify overlay,
- 510 km justify surface treatment,
- 85 km justify sealing and
- 765 km of gravel roads merit regravelling.

10. The economic rates of return varied from a maximum of more than 100% to a minimum of 15.8% for the finally accepted projects. The average rate of return by year of implementation of sub-project and surface type is:

Year	Paved	Gravel	Total
1992	37.3%	34.5%	36.1%
1993	33.7%	50.7%	36.9%
1994	43.8%	65.0%	49.4%
1995	36.7%	48.0%	39.3%

11. The phasing of implementation of sub-projects originally took account of their estimated economic rate of return, with sub-projects with higher rates being allocated to the earlier years of the project, but in course of preparation of the Project, the evaluation results changes as the construction cost estimates and other critical values were revised. The range of evaluation results is now so small that it was seen to be little advantage in redesigning the Project on the basis of the latest evaluation results.

Sensitivity tests

12. Three full sensitivity analysis were carried out on the economic evaluation of these project components; the first analysis considered a 25% increase in construction and maintenance costs, but kept the benefits constant. On the paved network, all sub-projects maintained acceptable rates of return. On the gravel network, five sub-projects, with a total length of 87 km and a total cost of US\$ 3.7 million failed to achieve a satisfactory rate of return. There are reasons to believe that the economic rate of return on the these sub-projects is underestimated because of the conservative assumptions of traffic growth. They are all expected to have higher than average traffic growth rates because they provide links to committed new industrial developments. They have therefore been retained in the Project.

13. The second sensitivity test was to reduce project benefits by 30%. With this test, only one sub-project on the paved network failed to achieve a satisfactory rate of return. On the gravel network, in addition to the five links which failed to achieve an acceptable result on the previous test, a further four sub-projects were in this situation. Two of the four gravel network links were in the same geographic region as the sub-projects reviewed in the previous test and were retained in the Project for the same reason. The remaining three links which failed on the second test are in areas of exceptional projected agricultural development, and so are also expected to have benefits in excess of those evaluated and so are retained in the Project. With the reduction of passenger time benefits to zero, all subprojects maintained acceptable rates of return.

Detailed results

14. The estimated cost and economic rate of return for each road link are shown in Tables 1 and 2. The rates of return are based on comparing the cost and benefits of the proposed solution with the second best alternative. A minimum rate of return of 12% was required for any road periodic maintenance project to be included in the program. Values in excess of 60% are considered unreliable as they assume that the benefits of the project can be invested in other projects providing a similar high rate of return. These sub-projects will provide rates of return of at least 60%, it is the excess above this rate which is uncertain. The weighted economic return is for the four-year program as a whole. Given the sensitivity of economic rates of return to the investment cost of sub-projects, agreement will be reached during negotiations that, before undertaking any investment, IDA will be consulted if final engineering for any sub-project results in cost estimates exceeding the original estimate by more than 25% in dollar terms.

15. The economic analyses described above underestimate the true economic benefits of the road rehabilitation program because it they not quantify the additional benefits to be derived from increased industry activity or lost production due to higher transport cost under the second best alternative. They do not take account of the benefits of generated traffic or the benefits of reduced interruptions to transport flows from bridge and road flood washaways.

Additional analyses

16. Furthermore, the Bank's HDM model was used to analyze different quantity standards for routine maintenance and select the optimum alternative for a specific road condition. The levels of maintenance were so optimized and used in the SAM to obtain the maintenance program and budget. Another model, the Expenditure Budgeting Model was then used, interacting with the HDM model, to select the maintenance policies and maximize the investment under the budget restrictions. These new quantity standards were then used in the SAM to determine another maintenance program, adjusted to the resources available.

BOLIVIA

SECOND HIGHWAY MAINTENANCE PROJECT

Annex 12
Table 1

RESULTS OF ECONOMIC EVALUATION

a) Paved network		----- Sensitivity Tests -----							
Link	Road Section	Length kms	AADT veh/ day	Cost/km US\$	Total Cost US\$	Basic ERR %	Cost +25% ERR %	Benefit -30% ERR %	Passengers Time = 0 ERR %
First Year Program									
1	EL ALTO-VIACHA	21.2	1083	81,048	1,718,218	51.3	43.2	34.7	44.6
2	LA PAZ-COTAPATA	38.5	556	45,886	1,766,607	16.6	12.7	8.4	16.5
3	WARNES-MONTERO	19.6	1960	94,310	1,848,485	28.0	23.7	18.8	na
4	SAN ISIDRO-LA PALIZADA	7.2	156	53,300	383,225	27.5	22.7	17.5	24.6
5	LA PALIZADA-ABRA DEL QUIN	8.9	175	53,300	471,703	28.3	23.1	17.4	24.5
6	ABRA DEL QUINE-MATARAL	19.5	175	53,300	1,037,213	28.3	23.1	17.4	24.5
7	MATARAL-AGUA CLARA	26.0	235	53,300	1,385,794	58.1	48.4	38.6	50.8
8	AGUA CLARA-MAIRANA	24.5	235	53,300	1,305,844	58.1	48.4	38.6	50.8
9	TARUMA-LA GUARDIA	36.3	939	16,733	607,409	23.3	19.9	16.0	na
Sub total		201.6		52,205	10,524,498	37.3	31.0	24.3	27.5
Second Year Program									
10	QUILLACOLLO-VINTO	4.0	4002	60,305	241,218	59.5	52.2	44.5	na
11	VINTO-SUTICOLLO	8.6	1620	56,691	487,544	48.2	34.6	28.4	40.7
12	SUTICOLLO-PAROTANI	13.0	882	82,851	1,077,063	38.9	31.7	24.5	34.6
13	PAROTANI-CONFITAL	78.7	689	77,237	6,078,561	21.5	17.2	12.5	19.4
14	GUABIRA-KM 24	24.0	600	87,278	2,094,660	43.1	36.9	30.0	37.3
15	KM 24-OKINAWA	21.0	600	130,945	2,749,853	43.1	36.9	30.0	37.3
16	ORURO-VINTO	5.7	1144	24,588	140,149	86.4	73.2	59.0	74.1
17	VINTO-MACHACAMARCA	25.1	491	48,689	1,222,092	23.0	18.0	12.6	18.8
18	GUABIRA-MINEROS	27.0	1267	79,212	2,138,711	40.4	33.8	26.8	na
19	MINEROS-CHANE	13.0	466	155,565	2,022,339	33.8	27.6	21.0	27.4
Sub total		220.1		82,927	18,252,190	33.7	27.8	21.7	24.4
Third Year Program									
20	COCHABAMBA-ANGOSTURA	14.7	1841	70,000	1,027,600	79.7	71.3	62.3	74.4
21	ANGOSTURA-TOLATA	14.7	1277	70,000	1,031,800	50.7	44.9	38.7	47.4
22	TOLATA-PARACAYA	11.5	897	70,000	802,200	33.0	26.4	19.5	25.7
23	RIO SECO-HUARINA	58.2	735	35,000	1,967,000	41.4	35.1	28.3	34.5
24	HUARINA-TIQUINA	39.0	335	35,000	1,365,000	27.0	21.0	14.6	20.3
25	TOMATAS-TARIJA	3.5	1748	18,800	65,800	63.0	55.5	47.4	na
26	TARIJA-Cr. SAN GERONIMO	5.7	997	18,800	107,160	52.5	45.7	38.4	na
27	Cr. SAN GERONIMO-PADCAAYA	40.0	324	18,800	752,000	30.8	25.9	20.5	28.4
Sub total		185.3		38,421	7,118,560	43.8	37.4	30.6	36.9
Fourth Year Program									
28	PARACAYA-LA VILLA	5.5	468	40,000	219,600	72.0	61.7	51.3	62.4
29	LA VILLA-EPIZANA	79.6	222	40,000	3,182,000	20.9	16.3	11.5	19.1
30	EPIZANA-POJO	73.8	135	40,000	2,952,000	49.5	42.1	34.4	46.7
31	TOLATA-CLIZA	7.2	948	40,000	288,000	41.1	34.5	27.6	33.5
32	PARACAYA-PUNATA	3.0	925	40,000	120,000	62.9	53.6	43.9	55.1
Sub total		169.0		40,000	6,761,600	35.7	30.5	24.1	33.8
Total Paved Road Sub project		776.0		54,969	42,656,848	36.6	30.6	24.2	28.7

SECOND HIGHWAY MAINTENANCE PROJECT

Annex 12
Table 2

RESULTS OF ECONOMIC EVALUATION

b) Gravel network		----- Sensitivity Tests -----							
Link	Road Section	Length kms	AADT veh/ day	Cost/km US\$	Total Cost US\$	Basic ERR %	Cost +25% ERR %	Benefit -30% ERR %	Passengers Time = 0 ERR %
First Year Program									
1	HUARINA - ACHACACHI	20.0	330	26,016	520,320	48.9	39.0	32.2	39.9
2	ACHACACHI - ANCORAIMES	36.0	200	21,246	764,870	86.2	69.3	57.7	70.1
3	VILLA TUNARI - ETERASANA	27.0	495	18,557	501,026	122.2	92.0	72.9	96.1
4	QUILLACOLLO - BELLA VISTA	5.0	219	28,241	141,206	114.5	92.4	77.1	87.7
14	SAN MIGUEL - SAN FRANCISC	23.0	225	24,674	567,497	41.4	33.5	28.0	35.9
5	LA LOMA-AROMA	11.0	229	28,895	317,844	16.3	na	na	14.5
6	INGENIO MORA-SAN JOAQUIN	11.0	129	45,150	496,646	15.8	8.2	2.8	na
7	OKINAWA-Pto. BANEGAS	15.0	280	34,863	522,945	19.9	11.6	5.9	na
8	Cr.Rt.4-GUIRUSILLAS	29.0	89	41,335	1,198,718	18.2	12.8	8.9	14.5
9	TEXAS-CANDELARIA	20.0	146	52,188	1,043,756	15.6	10.9	7.5	12.5
10	ANCORAIMES - ESCOMA	39.0	145	13,130	512,055	54.7	43.3	35.5	44.3
11	LA PALIZADA-PUENTE TAPERA	43.0	104	29,520	1,269,375	24.4	18.3	13.9	20.5
Sub total		279.0		28,159	7,856,258	34.5	26.0	20.7	27.1
Second Year Program									
12	EL ALTO - CHACALTAYA	22.0	110	11,585	254,872	22.1	15.7	11.1	19.0
13	Cr.Rt.7 - Pto. VILLARROEL	25.0	240	19,193	479,837	26.9	21.5	17.4	23.6
14	Cr.Rt.4 - CAPINOTA - IRPA	29.0	282	16,588	481,052	111.2	na	na	na
15	POJO - LIMITE DISTRITAL	34.0	135	20,637	701,658	90.4	72.2	68.3	na
16	MATARAL-VALLE GRANDE	53.0	65	17,696	937,879	20.8	14.4	9.5	17.4
17	MADRECITAS-SAN NICOLAS	12.0	108	49,258	591,090	15.6	7.1	0.9	na
18	LIMITE DISTRITAL-COMARAPA	25.0	131	15,025	375,621	103.6	82.0	67.5	83.7
19	COMARAPA-SAN ISIDRO	20.0	156	12,387	247,730	179.1	141.8	116.7	96.4
20	YAPACANI-COLOHIA SAN JUAN	13.0	247	13,885	180,511	119.0	95.9	80.3	102.1
Sub total		233		18,241	4,250,250	50.7	39.0	32.3	25.0
Third Year Program									
21	MALLASA - VALENCIA	14.0	157	26,016	364,224	39.6	29.9	23.1	33.1
22	Cr.Rt.4 - EL PASO	6.0	338	16,588	99,528	177.7	141.6	117.5	139.8
23	AIQUILE-EPIZANA	89.0	116	16,588	1,476,332	74.1	57.6	46.6	67.9
24	YAMPARAEZ-TARABUCO	36.0	129	16,588	597,168	39.3	31.1	25.3	34.5
Sub total		145.0		17,498	2,537,252	65.0	50.7	41.0	57.9
Fourth Year Program									
25	ORURO-CAPACHOS-PARIA	21.0	326	26,016	546,336	24.0	17.9	16.6	19.5
26	MACHACAMARCA-HUANUNI	22.0	217	26,016	572,352	91.6	76.3	65.7	72.0
27	SUCRE-YAMPARAEZ	29.0	145	16,588	481,052	51.1	40.3	32.8	43.8
28	COBIJA-PORVENIR	33.0	299	34,863	1,150,479	27.3	21.3	17.0	23.3
Sub total		105.0		26,193	2,750,219	48.0	37.6	30.9	36.3
Total Gravel Network		762.0		22,827	17,393,979	45.1	34.6	28.1	32.5
Total Project		1538.0		39,044	60,050,827	39.1	31.8	25.3	29.8

BOLIVIA

SECOND ROAD MAINTENANCE PROJECT

Environmental Impact

1. Introduction

The civil works financed by the Project are road works (periodic and routine), with no new construction or major upgrading. Therefore, they will not cause significant environmental impacts. Only minor impacts may be expected, mainly extraction of materials, used in road improvement and maintenance activities, and waste disposal. On the other hand, improved road maintenance implies environmental benefits by reducing road-related erosion and improving stream drainage at road crossings. A study of all these possible effects was carried out by a consultant hired by SNC and financed by the Export Corridors Project (Credit 2012-BO). The following paragraphs show a summary of this study, the conclusions and recommendations and the specifications to be included in the bidding documents and SNC's code of maintenance, as safeguards against the possible negative effects on the environment produced by the maintenance works.

2. Summary of the Study

The objectives of the study on the environmental impact of the road maintenance works included in the Project are:

- to assess the positive and negative effects on the environment produced by the programmed works;
- to establish the conditions to accept or modify the works; and,
- to prepare the recommendations to avoid or minimize possible negative impacts. (These recommendations will be incorporated as specifications into the bidding documents for all the civil works financed by the Project and into the SNC code of maintenance).

Introducing the environmental variable in the program of road maintenance will provide more secure decision making in choosing the best alternative, considering natural resources protection and development interests.

For the purposes of the study, Bolivia was divided into ecological regions according to the Ellenberg classification (modified). These regions are called environmental units and are the following: humid and mountainous jungle, low sub-humid jungle, easily flooded savanna with forest islands, low and mountainous semi-humid forest, low semi-arid mountain, semi-humid and semi-arid valleys, semi-humid puna with trees, high andean semi-humid puna floor with trees, semi-arid and arid puna, high andean semi-humid floor without cultivation, and high andean semi-arid and arid floor with cultivation.

The assigned environmental units are described in terms of its climatic conditions, types of vegetation, animal life, etc. Each unit shows the location and characteristics of national parks and protected areas. Some of these ecological regions or environmental units of Bolivia were visited by the consultant in order to analyze the environmental impacts caused by road construction, operation and maintenance, including landscape, hydric and edafologic resources, wild life, vegetation, use of land and human health. The problems created by the roads are described for each environmental unit. All positive and negative effects were classified in three categories, according to the benefits or damages caused in the ecosystems.

As a result of the analysis made, the study concludes that:

- a) The impact of road maintenance activities depends on the type of road and the environmental factors. Environmental impacts of road maintenance are minor compared to those produced by road construction and operation of the existing network.
- b) Most road maintenance works have positive impacts, especially those related to drainage improvements, including construction of channels, ditches and sewers. Such positive effects contribute to improve the landscape, geomorphology, hydrology and socioeconomic factors.
- c) The major negative impacts of the Project will be produced by the extraction and exploitation of materials for aggregates, which have a negative effect on the landscape, vegetation, soil and hydrologic systems. Deposits for waste materials will be selected with the assistance of a specialist in environmental impact and, once the quarries are abandoned, actions for fast vegetation recovery will be required.
- d) If some road embankment must be put up, the roads may become breakwaters and prevent the normal water flow. In these cases, road maintenance projects will include adequate bridges and sewers to avoid water damming.
- e) Negative impacts may also arise from asphalt overlays, due to detour construction, removal of damaged asphalt, and manufacture and spreading of asphalt mixes. Detours and accesses may alter the landscape, hydrology, soil, and vegetation at the local level, while the work with asphaltic mixes at high temperature could eventually damage the human health due to toxic gases and loud noise.

3. Conclusions and Recommendations

a) Conclusions.

- In general, the activities of the maintenance programs will have a positive impact for the ecosystems and the social medium.

- The proposed road maintenance programs will also eliminate or reduce negative impacts produced by past road construction and/or lack of road maintenance.

b) Recommendations.

- In road sections where the embankment must be reconstructed, particularly if they are in savanna and flat areas, drainage systems and adequate bridges will be provided. These will allow the normal flow of waters, avoiding damages to the nearby areas and the road itself.
- Borrow materials must be extracted preferably from distant quarries provided with adequate drainage, so that the landscape and the hydrologic system will not be altered significantly.
- The possible water bodies caused by existing embankments without adequate drainage in the vicinity of populated areas, must be adequately drained or, if it is not possible, the stagnant waters must be treated with adequate plant species to avoid infections and other health problems among residents.
- The SNC Environmental Unit (EU) must participate in the selection of quarries, to cause the minimum impact on the environment.
- Once the quarries are abandoned, fast action for re-establishing former vegetation should be taken. If necessary, autochthonous species will be sown.
- When graveling in zones close to populated areas, special gravel mixes with low levels of lime should be used as much as possible, in order to mitigate dust problems.
- Workers permanently in contact with dust or asphalt mixes must use mouth-nose protectors provided by the contractor, in accordance with the guidelines of the equipment manufacturer and with the existing labor regulations.
- The contractor/SNC must provide milk to the workers on a daily basis, to counteract the effects of the toxic gases from asphalt mixes in the human body.
- The contractor/SNC must provide ear, eyes, hand and feet protectors to their workers for removal of asphalt mixes by compressors.
- In zones where work compounds and workshops must be installed, the contractor/SNC must restore the original landscape in the place when the works are finished. Security measures should avoid spillage of contaminated hydrocarbons in the workshops.

- When the work compounds and workshops have to be installed in forest areas, the contractor/SNC will avoid the falling of trees and the lighting of fires, as much as possible.
- If maintenance activities are carried out done in protected areas or national parks, it will be necessary a specific assessment by the SNC Environmental Unit. In these cases environment recommendations for construction and feasibility should be considered and the assessment should be coordinated with the institution charged of protected areas at the national level.
- In order to assess the environmental impact of road maintenance, it is recommended to monitor regularly the main roads of the network. Quarterly reports will be prepared by the EU regarding possible environmental changes and suggesting correction measures.
- Fences and installations other than that needed for road services must be prohibited in the right-of-way areas.

4. Specifications for Contractors and SNC:

Based on the recommendations above, a set of specifications has been prepared. These specifications will be adopted by SNC and will be included in the bidding documents for works by contract and in the SNC's code of maintenance. Following is a summary of these specifications:

- Where the climatic conditions allow it, the existing organic ground on the top layer of quarries or lending stone banks should be kept and deposited for the subsequent recovery of the original conditions.
- After the extraction of materials from quarries or river beds, the contractor/SNC will re-establish the original vegetation and the ecological conditions of the areas where the materials were extracted.
- The contractor/SNC will require prior authorization, that should be justified in advance, to extract boulders, pebbles, sand or other construction materials from the beds of water courses.
- On flat lands subject to floods (stagnation) from water drains or with slow drainage (in particular, near towns or settlements) the contractor will not dig ditches or pits to extract borrow materials, without a drainage plan based on a land survey to adequate scale.
- In road sections where asphalt concrete or other materials must be removed and discarded, the contractor/SNC will deposit or bury them in far or isolated areas, but never in river beds or water courses.

- Asphalt plants will be installed, whenever possible, on easily accessible flat lands, lacking vegetation, and located not very close to towns.
- In nearby populated areas, the contractor/SNC will use, as much as possible, mixtures with a low lime content to avoid problems related with dust.
- In sections where the construction of embankments is necessary, the contractor/SNC will construct adequate bridge and drainage systems to allow stream drainage.
- In case of water bodies parallel to the roads, the contractor/SNC will construct drainage systems or plant decontaminating vegetable species to avoid infectious diseases.
- In flat lands, where road embankments must be put up, the contractor/SNC will use materials from deposits where the hydric system, land and vegetation will not be affected.
- During the works, the contractor/SNC will exercise all reasonable precautions, including the application of transitory and permanent measures, to control erosion and minimize the deposits in rivers, creeks, lakes and small lakes.
- During the works, the contractor/SNC will exercise all type of precautions as deemed reasonable to prevent pollution of rivers, creeks and lakes. The pollutants and noxious wastes will not be discharged along the rivers, creeks, small lakes or natural or artificial water channels that flow into them.
- In order to protect the cuts of land due to erosion, vegetable species adapted to the native ecological conditions will be planted on slopes and fillers.
- The contractor/SNC will take all reasonable precautions to prevent forest fires in any area involved in construction operations or occupied as a result of such operations. The Contractor/SNC will cooperate with the corresponding government agencies in the reporting, prevention and extinction of forest fires.
- In the case of any discovery of prehistoric ruins, indian settlements or of first settlers, cemeteries, relics, fossils, meteorites or other objects of archeological, paleontologic or special mineralogic interest during the works, the Contractor/SNC will take immediate measures to suspend temporarily the works and will cooperate in the protection, release and transportation of these findings.
- The Contractor/SNC should take the necessary measures to guarantee to workers and employees, the best conditions of hygiene, housing, nutrition and health. Personnel should be vaccinated and should

receive prophylactic treatment against epidemics and regional endemic diseases.

- The Contractor/SNC will provide their workmen ear and eye protectors and dust masks.
- The Contractor/SNC will take measures to avoid spilling of hydrocarbures nearby the work compounds.
- The contractors/SNC will prohibit their workmen to lumber trees and to light fires nearby the roads or the work compounds.
- Burning of combustibles will be done under constant supervision of competent supervisory personnel. Extreme care should be taken in the manner in which burning of materials takes place, so that it does not destroy or damage private property or produces excessive air pollution.

ENVIRONMENTAL IMPACTS OF MAINTENANCE PROGRAMS

ACTIVITY	IMPACTS ON THE ECOSYSTEMS */									
	Landscape	Geomorphology	Soil	Hydrology	Vegetation	Fauna	Health	Traffic	Vehicles	Socio-economy
Road Levelling and Grading	+			+				+	++	+
Construction of Channels, Ditches and Culverts	+	+		++				++	++	+
Embankment Construction	-	-	-	--+	-	+		+	+	+
Extraction of Materials	--	-	-	--+	-					
Crashing of Materials				-			-			
Regravelling								++	++	+
Detour Construction	-		-	-	-			-	-	
Asphalt Concrete Removal	-		-		-		-			
Asphalt Concrete Manufacturing							-			
Asphalt Concrete Spreading	-						-	+++	+++	++

(*) Positive:
 + low
 ++ moderate
 +++ strong

Negative:
 - low
 -- moderate
 --- strong

BOLIVIA
SECOND ROAD MAINTENANCE PROJECT

Supervision Strategy

The project includes a large number of sub-projects: sixty-one of road periodic maintenance and seventy-seven of bridge maintenance and repair. It also includes workcompound rehabilitation, equipment rehabilitation, purchases of complementary equipment, technical assistance, and a comprehensive training program. Furthermore, the project has to be monitored in the context of a substantially larger investment program for the 1992-96 period. Experience under the previous credit shows that the average ten man/weeks per year for supervision is insufficient to provide effective control over the program.

To reduce the need for IDA manpower, an expanding monitoring and reporting role will be played by the Borrower through the Project Executing Unit (UEP) in the National Road Service (SNC). For this purpose UEP will use a series of quantitative indicators based on the already implemented management systems, which monitor physical and financial aspects of project execution, and implementation of the road maintenance programs. SNC will recruit consultants, to be financed by the Credit, for assistance to the UEP and supervision of works. The consultants will report each quarter to the Ministry of Transport and Communications (MTC), SNC and IDA. All issues which will arise will be dealt with in joint meetings between SNC and IDA and during annual project reviews. During these meetings remedial actions will be agreed upon.

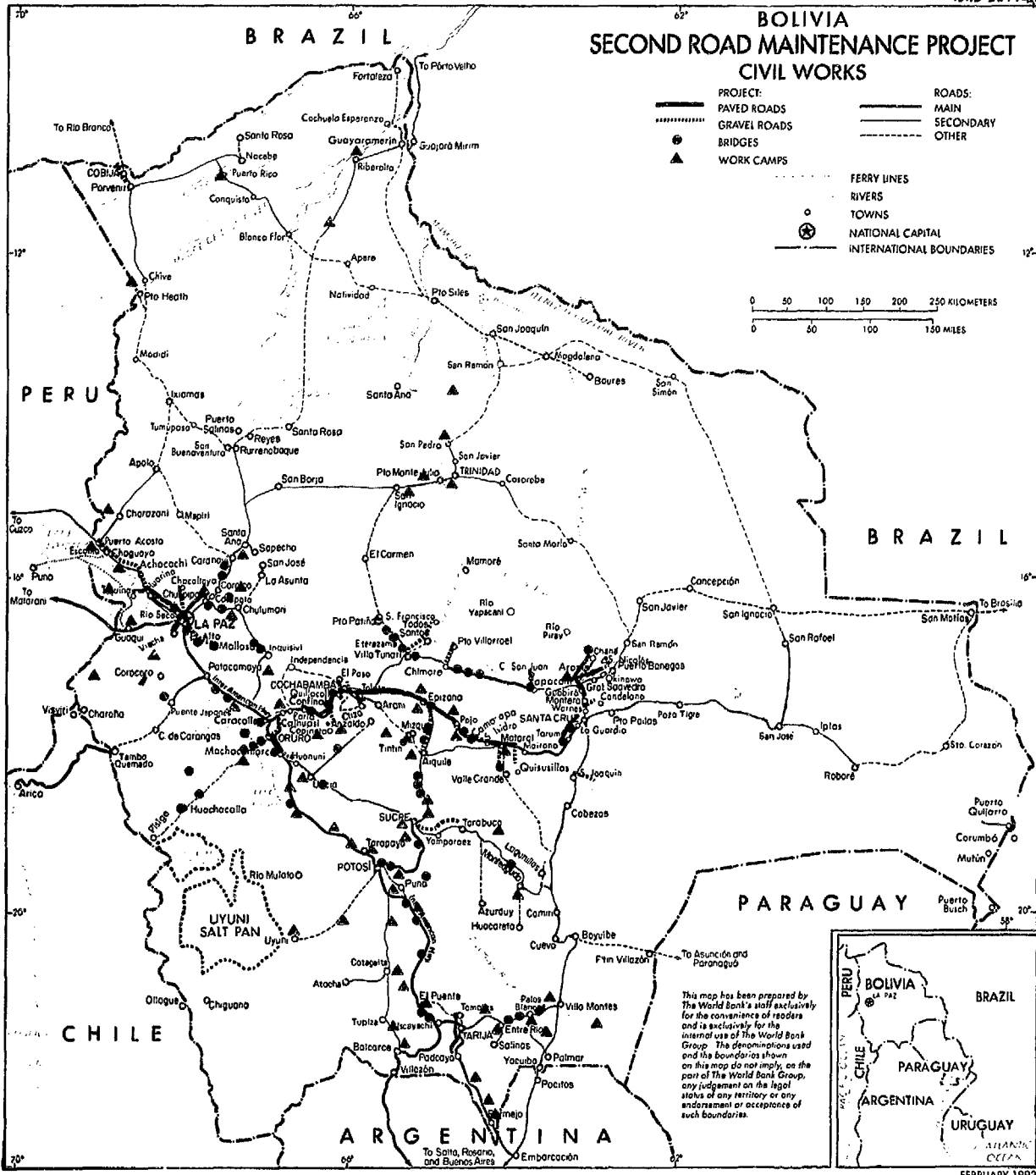
We intend to have a two-pronged IDA supervision. First, to allow intensive field supervision we will recruit a local consultant for a period of about 12 staff-weeks, in stretches of 3 weeks. After each 3-week assignment he will send to the Bank a report identifying any project issues. This arrangement will not be too costly, as we expect to pay no more than US\$3,000 per month, so the 12 weeks will cost us no more than about 4 weeks of regular staff. Second, we will provide about 12 staff-weeks of in-house supervision: 8 staff-weeks of the engineer's time (mainly for procurement and monitoring of technical assistance tasks and implementation of road maintenance plan) and 4 staff-weeks for the economist (user charges, maintenance financing and budgeting, evaluation of additional sub-projects, etc.).

In sum, we plan to dedicate about 24 staff-weeks to supervision, but at a cost which is equivalent to only 16 staff-weeks. Thus, supervision will be intensive but its cost within reasonable limits. We intend to put a special effort into a project launch workshop planned for Oct/Nov 1992 to establish the grounds for project implementation and supervision.

We have also provided for annual project reviews and a mid-term project review with the participation of SNC, Government (MTC, Ministry of Planning and Ministry of Finance) and IDA. The issues which will be given priority are: program of physical implementation of the project, execution of four-year road maintenance program and updating of five-year investment plan,

carrying out the decentralization program, restructuring of SNC, and progress on maintenance planning and budgeting and on the action program.

BOLIVIA SECOND ROAD MAINTENANCE PROJECT CIVIL WORKS



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