

MINISTRY OF ECONOMIC DEVELOPMENT OF THE REPUBLIC OF BOLIVIA
JAPAN INTERNATIONAL COOPERATION AGENCY

THE ENVIRONMENTAL IMPACT ASSESSMENT
OF
THE ROAD IMPROVEMENT
BETWEEN
SAN BORJA AND TRINIDAD
IN
THE REPUBLIC OF BOLIVIA

FINAL REPORT

MAIN VOLUME

OCTOBER, 1995

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CENTRAL CONSULTANT INC.

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PREFACE

In response to a request from the Government of Bolivia, the Government of Japan decided to conduct the Environmental Impact Assessment of the Road Improvement between San Borja and Trinidad in the Republic of Bolivia, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Bolivia a study team headed by Mr. Takao Yamane of Central Consultant Inc. two times between December 1994 and August 1995.

The team held discussions with the officials concerned of the Government of Bolivia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Bolivia for their close cooperation extended to the Study Team.

October, 1995



Kimio Fujita

President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

October, 1995

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan.

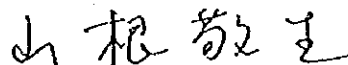
We are pleased to submit to you the final report on the Environmental Impact Assessment of the Road Improvement between San Borja and Trinidad in the Republic of Bolivia.

This study was conducted by Central Consultant Inc. under a contract to JICA, during the period December 1994 to October 1995. In conducting the study, we have examined the various environmental aspects related to the road improvement in Bolivia in order to complete the Environmental Impact Assessment of the Road Improvement between San Borja and Trinidad in the Republic of Bolivia.

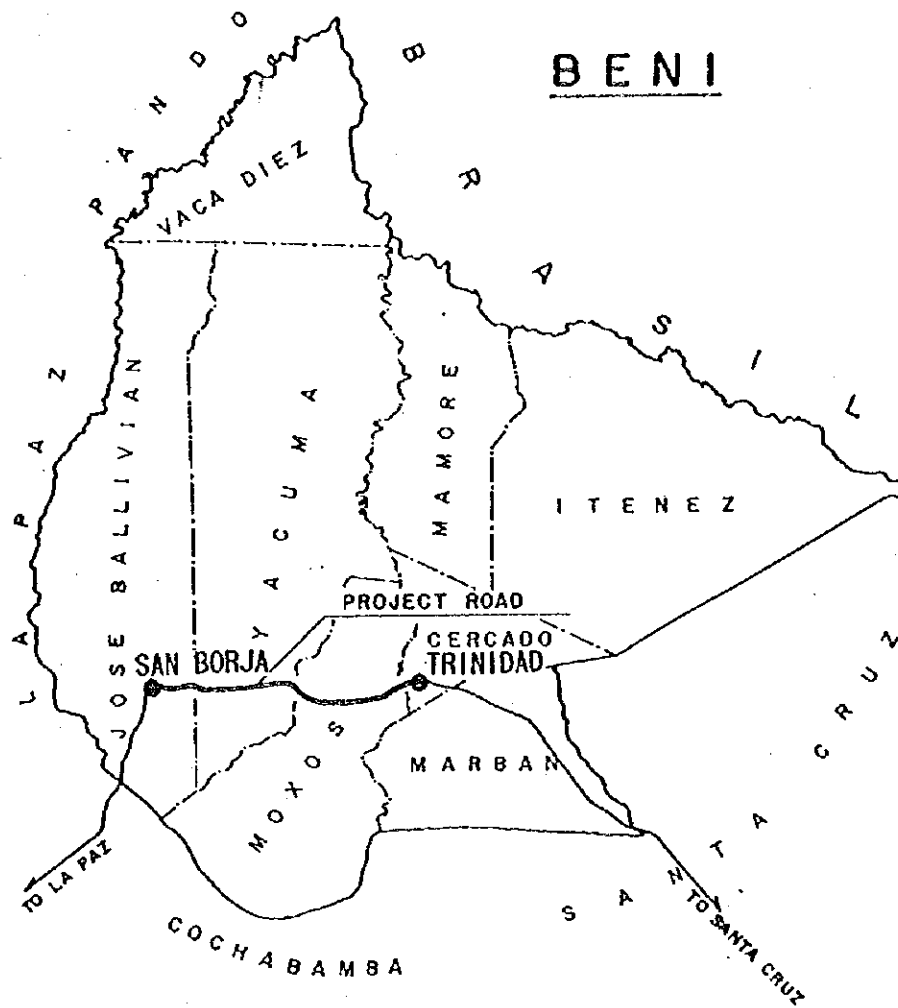
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA and the Ministry of Foreign Affairs. We would also like to express our gratitude to the officials concerned of the Ministry of Economic Development of the Republic of Bolivia and the Embassy of Japan in Bolivia for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



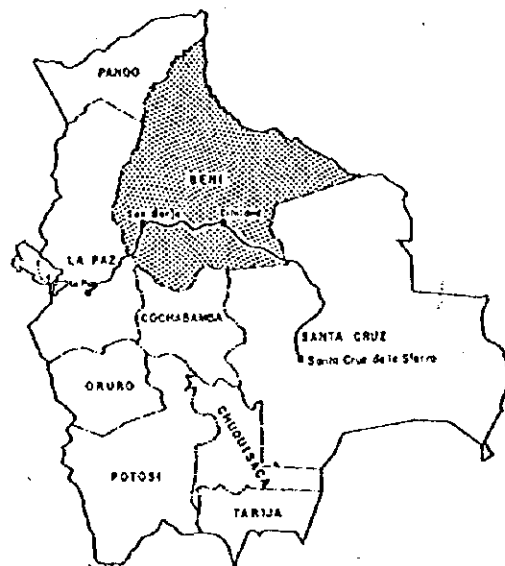
Takao Yamane
Project manager,
Study team on the Environmental Impact
Assessment of the Road Improvement between
San Borja and Trinidad in the Republic of Bolivia
Central Consultant Inc.



SOUTH AMERICA



BOLIVIA



**The Environmental Impact Assessment of the Road Improvement
between San Borja and Trinidad
Location Map**

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ABBREVIATIONS

(I) Organizations

AASANA	Administración de Aeropuertos y Servicios Auxiliares a La Navegación Aérea
AASHTO	American Association of State Highway Technical Officials
ACEPTA	Asociación de Empresas Privadas de Transporte Aereo
CCM	Comité Central Menonita
CDF	Centro de Desarrollo Forestal
CEATA	Centro de Experimentación y Asistencia Técnica Agropecuaria
CEPAS	Comisión Episcopal de la Pastoral Social
CEPIMA	Comite Ejecutivo del Proyecto Ichilomamore
CIAB	Centro de Investigaciones Arqueológicas del Beni
CITES	Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres
CNRA	Consejo Nacional de Reforma Agraria
CODEMA	Consejos Departamentales de Medio Ambiente
COMIBOL	Corporación Minera de Bolivia
CONADE	Consejo Nacional de Desarrollo
CONEPLAN	Ministerio de Planeamiento y Coordinación
CORDEBENI	Corporación de Desarrollo del Departamento del Beni
CORDECruz	Corporación de Desarrollo del Departamento de Santa Cruz
CORDEMOXOS	Corporación de Desarrollo de Moxos
DGHN	Dirección General de Hidrografía Naval
DIA	Declaratoria del Impacto Ambiental
EBB	Estación Biológica del Beni
ENDE	Empresa Nacional de Electricidad Sociedad Anonima
FONAMA	Fondo Nacional del Medio Ambiente
IDB	Inter-American Development Bank
IGM	Instituto Geografico Militar
IMF	International Monetary Fund
INAR	Instituto Nacional de Arqueología
INE	Instituto Nacional de Estadística
INC	Instituto Nacional de Colonización
INTI	Instituto Nacional de Tierras
ITTO	International Organization of Tropical Woods

JICA	Japan International Cooperation Agency
MACA	Ministerio de Asuntos Campesinos y Agropecuarios
MAU	Ministerio de Asuntos Urbanos
MDSMA	Ministerio de Desarrollo Sostenible y Medio Ambiente
MICT	Ministerio de Industria, Comercio y Turismo
MNHN	Museo Nacional de Historia Natural
MPC	Ministerio de Planeamiento y Coordinación
OTB	Organizaciones Territoriales de Base
PELT	Proyecto Especial del Lago Titicaca
PERT	Programa Ejecutivo de Rehabilitación de Tierras de Tarija
SEARPI	Servicio de Encauzamiento de Aguas del Río Piraf
SEGMA	Secretaría General del Medio Ambiente
SENAC	Servicio Nacional de Caminos
SENMA	Secretaría Nacional del Medio Ambiente
SERFOR	Servicio Forestal de la Nación
SNRU	Secretaría Nacional de Recursos Urbanos
SNA	Secretaría Nacional de Agricultura
SNM	Secretaría Nacional de Minería
SNMH	Servicio Nacional de Meteorología e Hidrología
UICN	International Union for Conservation
UTB	Universidad Técnica del Beni
YPFB	Yacimientos Petrolíferos Fiscales Bolivianos

(2) Symbols, Unit and Others

B/C	Benefit/Cost Ratio
BOD	Biochemical Oxygen Demand
CBR	California Bearing Ratio
CIF	Cost, Insurance, and Freight
COD	Chemical Oxygen Demand
FOB	Free On Board
GNP	Gross National Products
GDP	Gross Domestic Products
DAC	Development Assistance Committee
DIA	Declaration of Natural Environmental Impact
D.L	Decree Law
EEIA	Evaluation of Environmental Impact Assessment
EIA	Environmental Impact Assessment

FA	Ficha Ambiental
GCP	Ground Control Points
IRR	Internal Rate of Return
NGO	Non-Government Organization
NPV	Net Present Value
OD	Origin-Destination
OPS	Optical Sensor
OTB	Base Territorial Organizations
RBTI	Reserva de la Biósfera del Territorio Indígena
RGDP	Regional Gross Domestic Products
S.D	Supreme Decree
SPM	Suspended Particular Matter
SS	Suspended Solids
TCM	Tetramercury of Sodium
TSPM	Total Suspended Particular Matter
VOC	Vehicle Operation Cost

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

The objective area of this Study are the lowlands known as "Pampa" or "Llano" along the road between San Borja and Trinidad (about 228 km) in the Beni Department. This San Borja-Trinidad road is one section of National Road 3, connecting Trinidad with the capital, La Paz, the seat of government and the largest center of consumption in Bolivia, through the Beni Department, the largest agricultural and livestock production area. This road was completed in 1976. However, because it was built with a low-standard structure, collecting embankment materials from along both sides of the road, and because the embankment was only 40 - 50 cm above the ground, it is now difficult for vehicles to circulate safely because of the severe road damage in many sections of the road. In addition, the road section 40 - 50 km west of Trinidad is completely inundated during the rainy season, making it impassable at this time of year. Therefore, the early completion of National Road 3, an all-weather-road, is one of Bolivia's priority projects.

To date, the government of Bolivia has improved National Road 3 from La Paz for the following reasons:

- To develop the agricultural and livestock potential in this lowland area.
- To supply products from the Beni area to other areas more cheaply and more speedily.
- To attract settlers from other areas.
- To implement government policies that reflect the Beni area easily.

To date, National Road 3 has been improved from La Paz up to San Borja. Therefore, the road section between San Borja and Trinidad is the only section currently requiring urgent improvement.

According to the above circumstances, in 1985 the government of Bolivia requested a road improvement study of this road section. In response to this request, the government of Japan conducted "The Study of Road Improvement Between San Borja and Trinidad" from November 1985 to July 1987 and "The Study of Road Improvement Between San Borja and Trinidad (Phase II)" from September 1987 to January 1989.

Based in the results of these studies, the government of Bolivia planned to begin improving this road after obtaining a loan from the Inter-American Development Bank (IDB). However, due to growing worldwide concerns for environmental conservation, the IDB now requests that all projects first implement an environmental impact study. However, because of the government of Bolivia's difficult situation, it could not implement this environmental study due to financial and technical considerations; consequently, it requested the government of Japan to carry out this environmental study on the above road improvement. Responding to this request, the government of Japan dispatched a Preparatory Study Team through the Japan International Cooperation Agency (JICA). Based in the results of discussions between the Preparatory Study Team and the Bolivian side, the Scope of Works was defined in March 16, 1994, and the implementation of this Study was determined.

1.2 Purpose of the Study

The main purposes of the Study were the following:

- ① To conduct an environmental impact study on the road improvement between San Borja and Trinidad.
- ② To review project costs.
- ③ To conduct an economic evaluation.
- ④ To transfer the necessary technology to the Bolivian counterparts through the implementation of the Study.

1.3 Objective Area of the Study

The objective area of the Study included all the areas indicated in Figure-1, within 50 km of either side of the road, areas expected to be socially and physically effected by the road improvement project. Additionally, the national park, the dwelling place of natives such as Chimanes, Yuracare, etc., and the forest area were also included as part of the objective area.

1.4 Basic Approach to the Study

The Study was carried out according to the basic flowchart shown in Figure 1-4-1. The main items of the Study are the following:

- ① Collection and analysis of data and information.
- ② Confirmation of various laws, regulations, and guidelines relevant to the environment.
- ③ Analysis of remote sensing data.
- ④ Field reconnaissance survey during both the rainy and the dry seasons.
- ⑤ Environmental impact analysis.
- ⑥ Setting of the environmental preservation goals.
- ⑦ Forecasting the future environmental situation.
- ⑧ Environmental evaluation.
- ⑨ Examination of the environmental preservation measures.
- ⑩ Establishment of a monitoring system.
- ⑪ Re-estimation of project costs including environmental counter-measures costs.
- ⑫ Re-examination of economic feasibility.
- ⑬ Comprehensive environmental evaluation.

The detailed work flow is presented in Figure 1-4-2.

1.5 Contents of the Report

The results of the Study were included in the following reports:

- ① Inception Report
Study contents and schedule - end of December 1994
- ② Draft Final Report
Results based on a study conducted during the rainy season - beginning of July 1995
- ③ Final Report
 - a) Results of the whole study, and
 - b) Revision of the Draft Final Report, together with the comments of the Bolivian government - end of October 1996

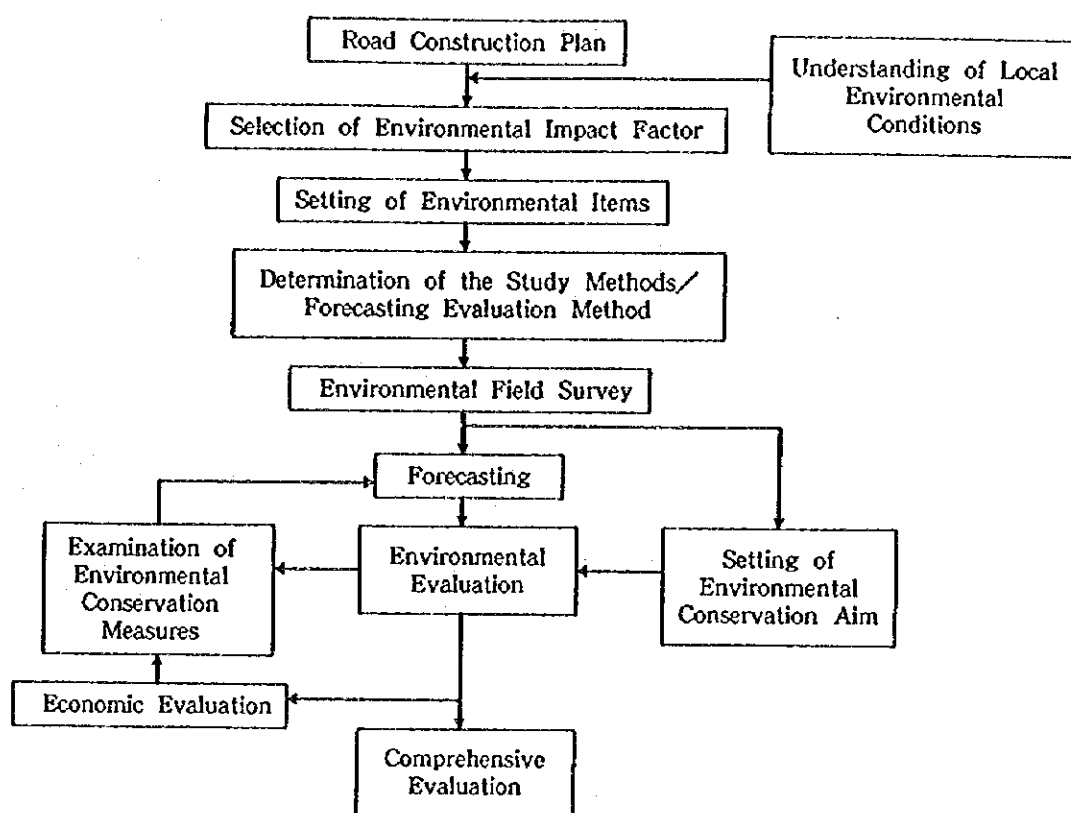


Figure 1-4-1 Basic Flow of the Study

1.6 Study Organization

The Study Team included following personnel:

Project Manager (Social Environment)	: Mr. Takao Yamane
Natural Environment	: Mr. Ikuhiro Hayashi
Natural Environment	: Mr. Mikio Kajima
Road Engineer	: Mr. Kunihiko Okazaki
Economist	: Mr. Hiroyuki Kotani
Coordinator	: Mr. Seiichi Aoto

The JICA coordinator was:

Mikako Kudou (predecessor)	: Social Development Study Department, Japan International Cooperation Agency
Naofumi Yamamura (successor)	: Social Development Study Department, Japan International Cooperation Agency

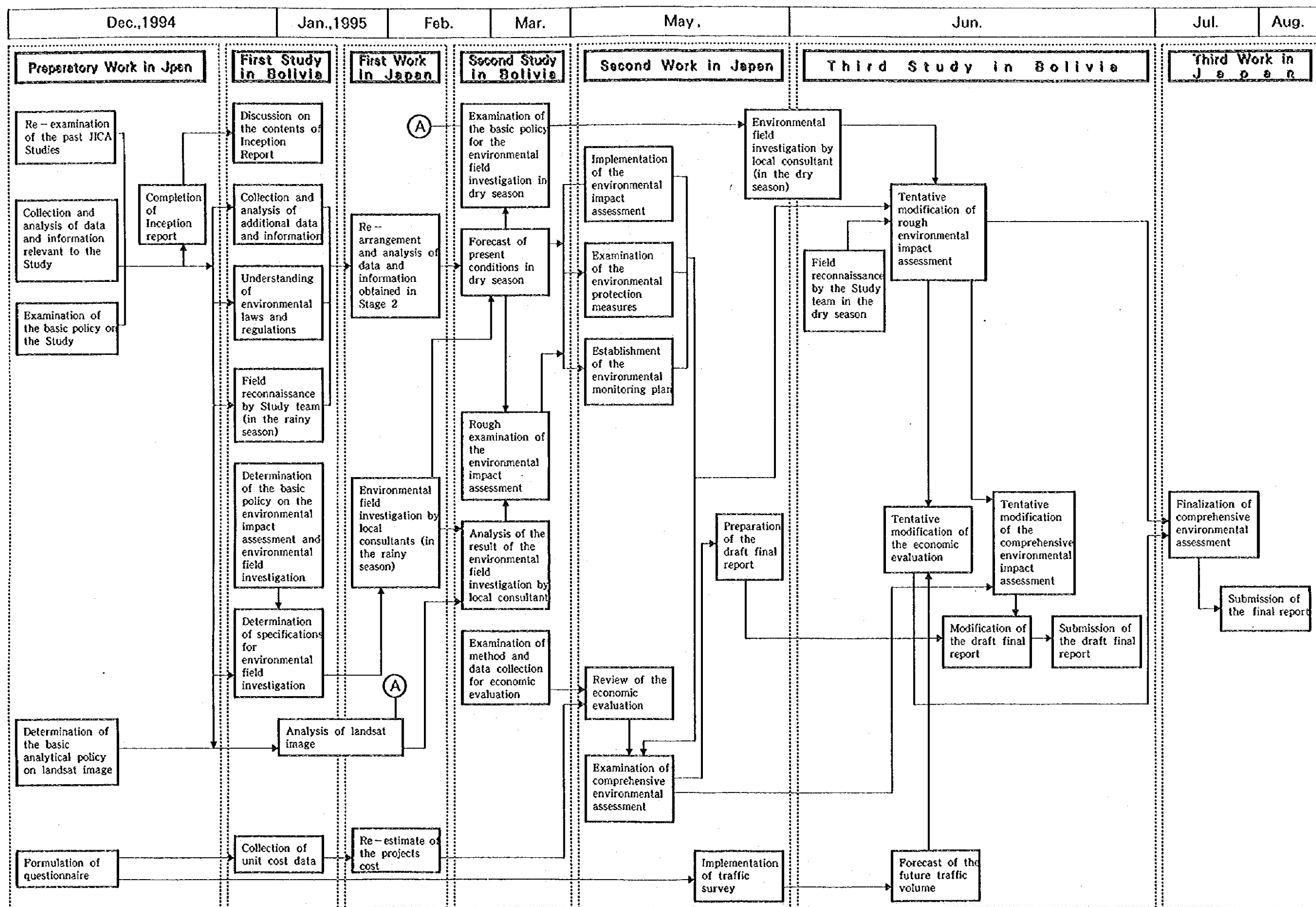


Figure 1-4-2 Detailed Flow Chart

CHAPTER 2

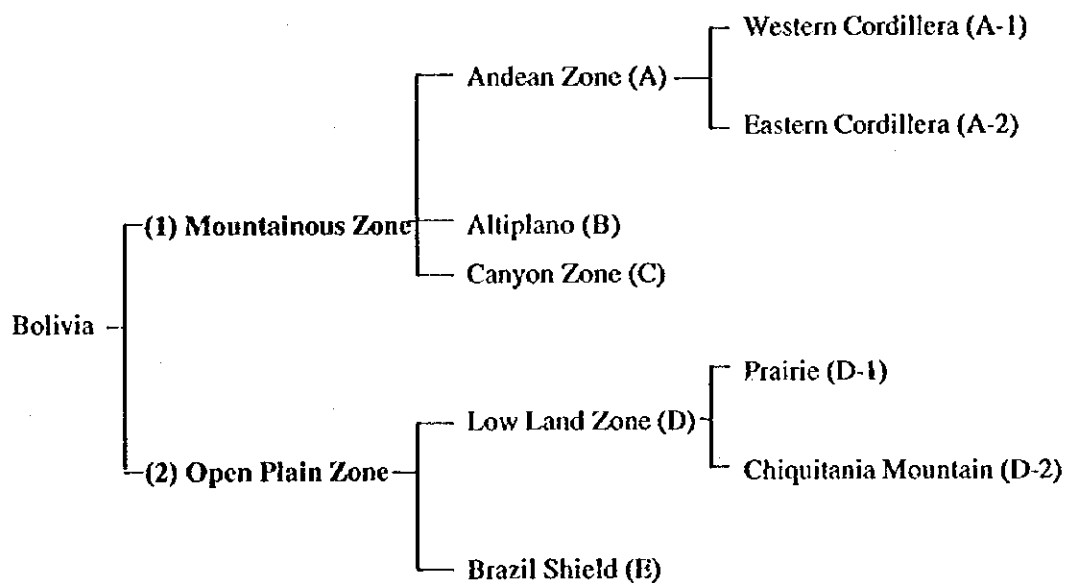
PRESENT CONDITIONS OF THE STUDY AREA

CHAPTER 2 PRESENT CONDITIONS OF THE STUDY AREA

2.1 Natural Condition

2.1.1 Topography

The Republic of Bolivia is a land locked country in the center of South America surrounded by Peru, Brazil, Paraguay, Argentina and Chile. The area of the country is about 1.1 million km², almost three times the size of Japan. From a topographical viewpoint, the country is divided into a Mountainous Zone and an Open Plain Zone. These two zones can be further subdivided into the following regions, as shown in Figure 2-1-1:



(1) Mountainous Zone

The Mountainous Zone accounts for almost one third of the country, and is divided into three zones, the Andean Mountains, Altiplano and the Canyon Zone.

a) Andean Mountains (A)

The Andean Mountains are further subdivided into a Western Cordillera and an Eastern Cordillera. These areas have an extremely rough and complex terrain with many deep

canyons formed by glacial erosion. A great part of this area is semi-barren with many mountains over 5,000 m above sea level.

Altiplano (B)

This area, surrounded by the Western Cordillera and Eastern Cordillera, is a large plateau with an area of 180 km by 500 km, lying 4,000 m above sea level.

Canyon Zone (C)

This zone forms a belt with a lot of deep canyons along the Eastern side of the Eastern Cordillera. The ground level of the Eastern and Western edge of this area is approximately 300 m and 3,000 m above the sea level, respectively.

(2) Open Plain Zone

The Open Plain Zone accounts for two-thirds of the entire country.

Low Land Zone (D)

This area is a prairie, 200 to 500 km wide and 1,500 km long; it includes both the Amazon and La Plata River Basins. It is 3,500-4,000 km from the mouth of the Amazon River. Most of this area is only 150-250 m above sea level, and is therefore often inundated. The Study area is located in this Prairie, and the detailed topography of this area is described in section 2.3.

Brazil Shield (E)

The Brazil Shield runs along the border with Brazil and is a peneplain which was formed by erosion in ancient times.

References:

- A-1 Western Cordillera
- A-2 Eastern Cordillera
- B Altiplano
- C Canyon Zone
- D Brazil Shield
- E Chiquitania Mountains

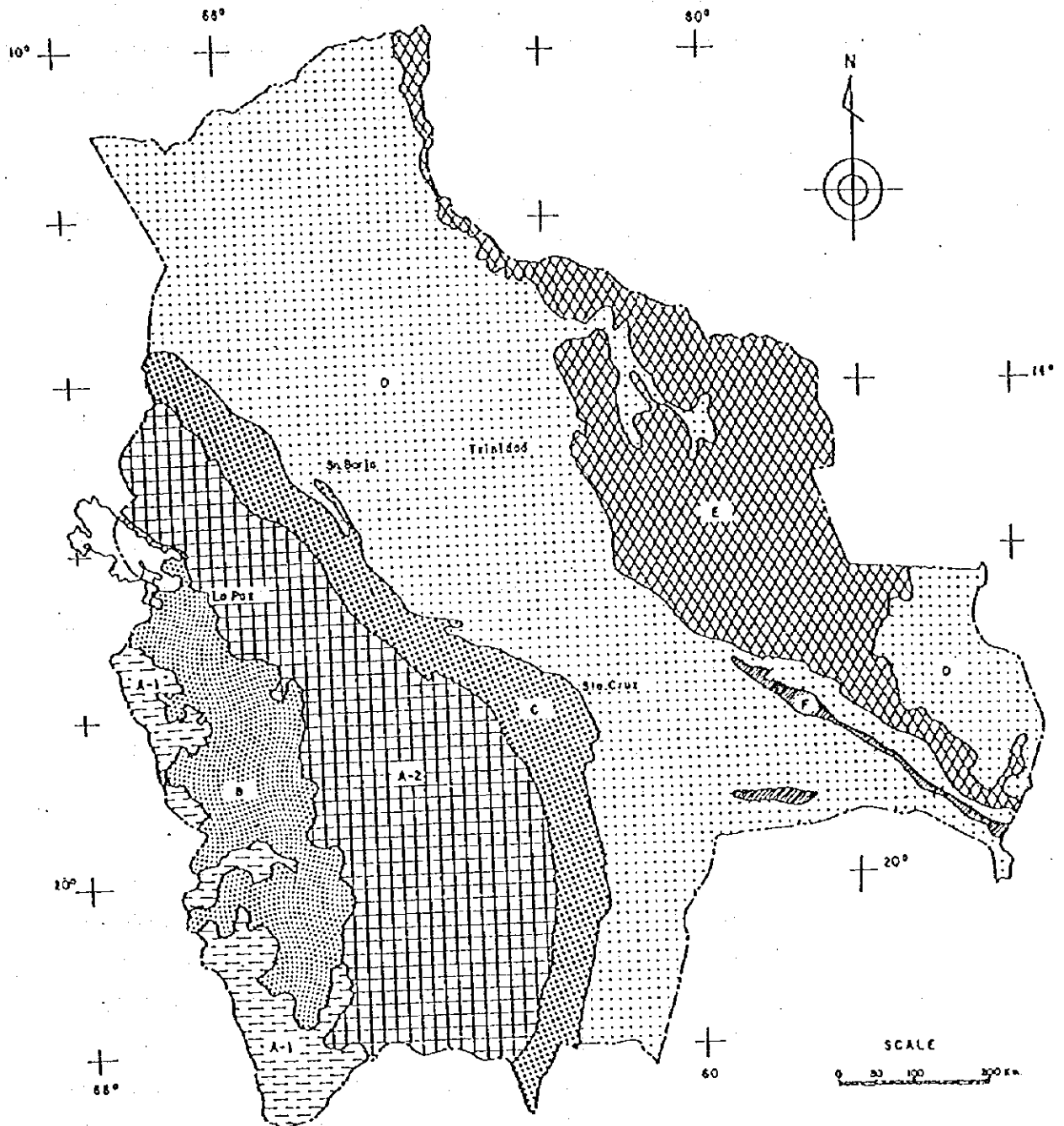


Figure 2-1-1 Topography in Bolivia

2.1.2 Geology

It is assumed that the Eastern Cordillera was formed by the subduction of the Nazca Plate under the continental shelf. This caused the eruption of magma that expanded the crust of the Western Cordillera, creating a compressive force that was transmitted to the East. In the Miocene, Pliocene and Diluvial eras, this force produced a reverse fault, a fold, and elevation in the thick bed of the Eastern Cordillera, resulting in high mountains in the sedimentary rock area. The Eastern Cordillera and the Canyon Area were Mio geosyncline in the Paleozoic era, and was mainly clastic deposits settled on the continental shelf and continental slope in those days. Supposedly, some areas here have a thickness of 10,000 m. Marine sedimentation is considered to have lasted up until just before the peak elevation of the Eastern Cordillera was formed, from the later Palaeogene era to the early Neogene era. The sedimentation of the terrigenous deposit extended from the later Tertiary period to the early Quaternary period, when the greatest elevation was supposedly formed. It is relevant to note that the geology of the surveyed area was formed without pyrogenic action. Rivers flowing toward the East from the Eastern Cordillera are blocked by the Brazil Shield. The Eastern Cordillera stretches out from the West, from a point around 400 km North of the study area, and the Brazil Shield stretches out from the East, thereby forming a natural catch basin. As a result of the repeated leveling action and flow of those rivers over a long period of time, a huge low-ground plain has been formed with a sedimentary stratum that is supposedly hundreds of meters thick. The Quaternary deposits which form this extensive low-ground plain are characterized in that they contain no gravel, since the transported materials were ground up into small pieces when the river flowed into the Study area. Two reasons were considered.

- a) An examination of the little gravel found at the bottom of the Eastern Cordillera reveals that the grains of sandstone are extremely small and are almost silt. For example, if the rocks originally formed by small grains get broken into smaller pieces through, for example, weathering, erosion and abrasion during transportation, the size of the grains will surely not be larger than the original grains.
- b) The rocks forming the Eastern Cordillera are sedimentary rocks which were formed by marine sedimentation from the Paleozoic era to the Tertiary period. These include sandstone, mudstone, shale, and slate. Since they were formed without any pyrogenic action, they are very weak in concretion and low in abrasion resistance.

An explanation of the geological distribution of soil deposits near the surface of the earth is shown below. Figure 2-1-2 shows the results of a particle size test conducted using soil sampled from the surface layer (less than 1.5 m deep from the surface) at 55 representative points in the Amazonian Low Ground Area. Obviously, this diagram shows that the geology here mainly consists of fine grain soil and gravel. Sand is seldom found, as mentioned above.

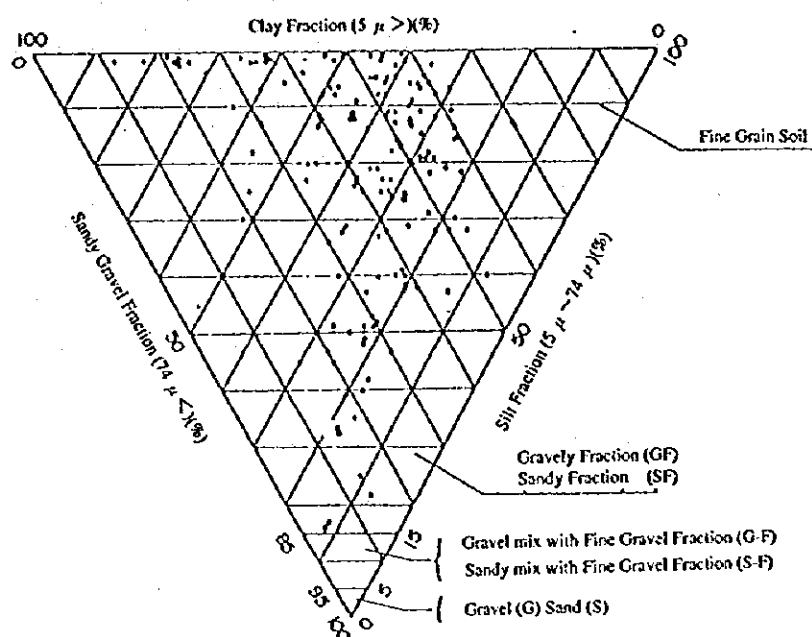


Figure 2-1-2 Soil Particle Size in the Low Ground Area (Amazon River Basin)

2.1.3 Meteorology

The climatic conditions in Bolivia vary widely according to the latitude and height above the sea level. The climate is characterized by the following three zones:

(1) Altiplano Area (Plateau and Canyon Zone)

The Altiplano Area, situated between the Eastern and Western Cordilleras on the western side of Bolivia, is a cold dry zone with an annual average temperature of 5 to 20°C (maximum of 25°C and minimum of -10°C). The wind blowing from the Amazon River Basin carries rain toward the Altiplano Area, but reaches the high plateau after discharging most of the rain on the low flat land area and on the Canyon Zone. Consequently, the annual average rainfall is normally less than 500 mm. Therefore, the Southern plateau has an extremely cold dry climate throughout the year.

(2) Amazon Low Land Area

The climate in this area is hot and humid, and the average temperature varies between 20 and 30°C. Annual rainfall is ordinarily from 1,000 mm to 3,000 mm. The objective road of this Study is located in this area, that is, the Beni area. The climate of the Beni area is tropical with a rainy season during the summer and a dry season during autumn, winter, and spring. The rainy season occurs when air masses coming from the Atlantic Ocean travel over the Andes at a high altitude.

(3) La Plata Low Land Area

A warm steppe climate producing a dry winter characterizes this area. The average annual temperature is between 20 and 25°C, and annual rainfall is around 1,000 mm.

The annual average temperature, evaporation, and rainfall in Bolivia are shown in Figures 2-1-3, 2-1-4 and 2-1-5, respectively.

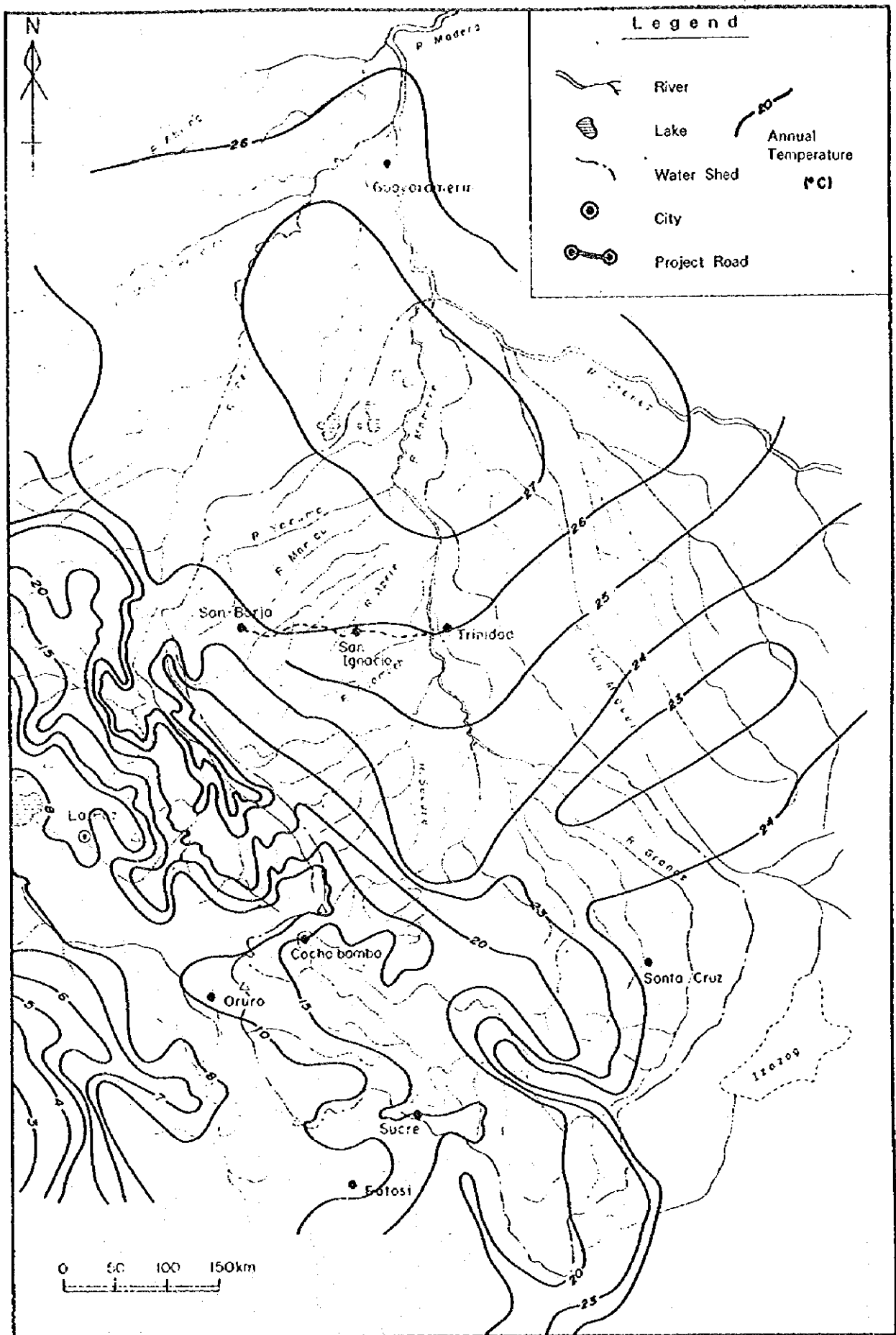


Figure 2-1-3 Annual Average Temperature in Bolivia

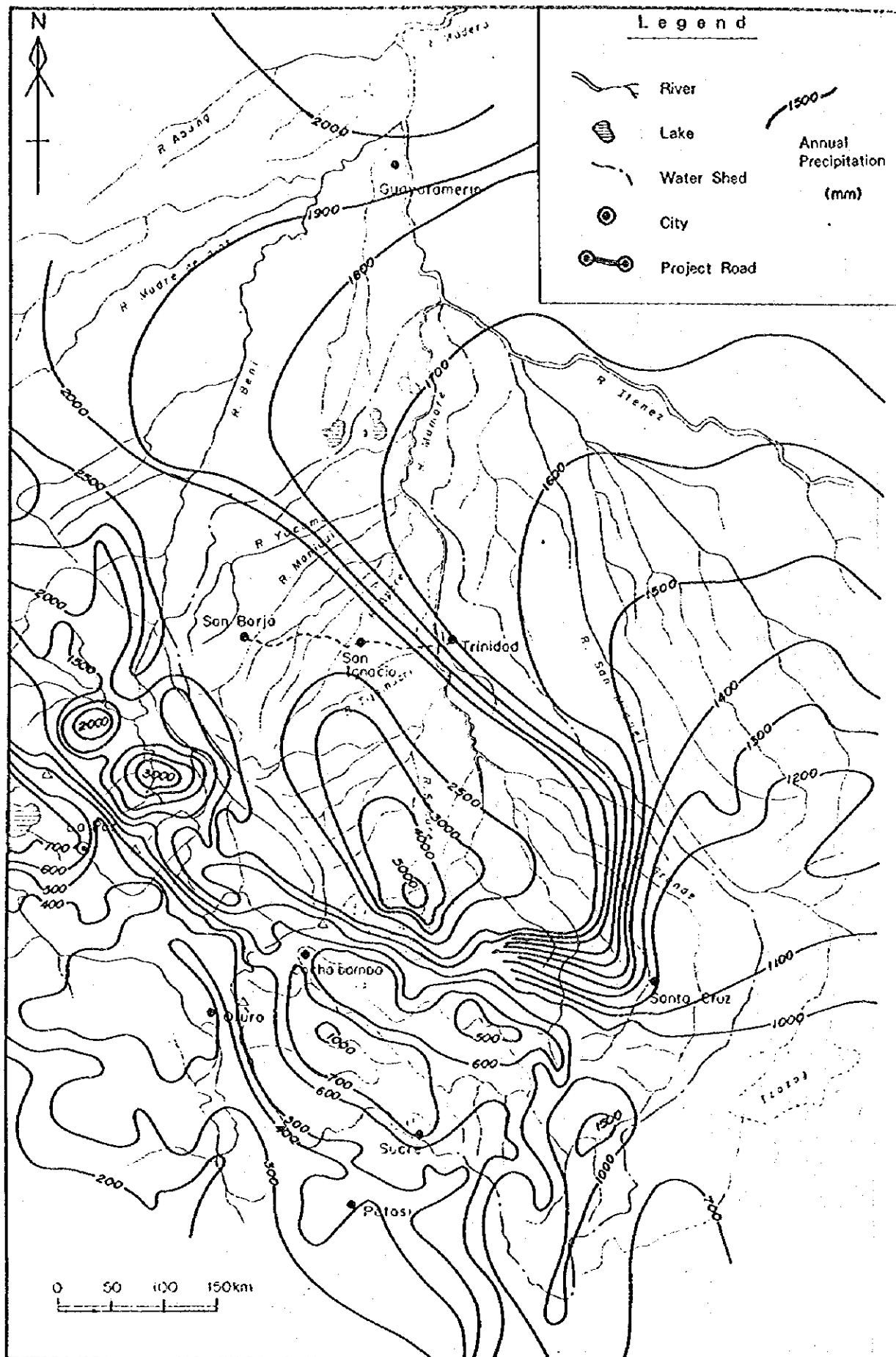


Figure 2-1-4 Annual Rainfall in Bolivia

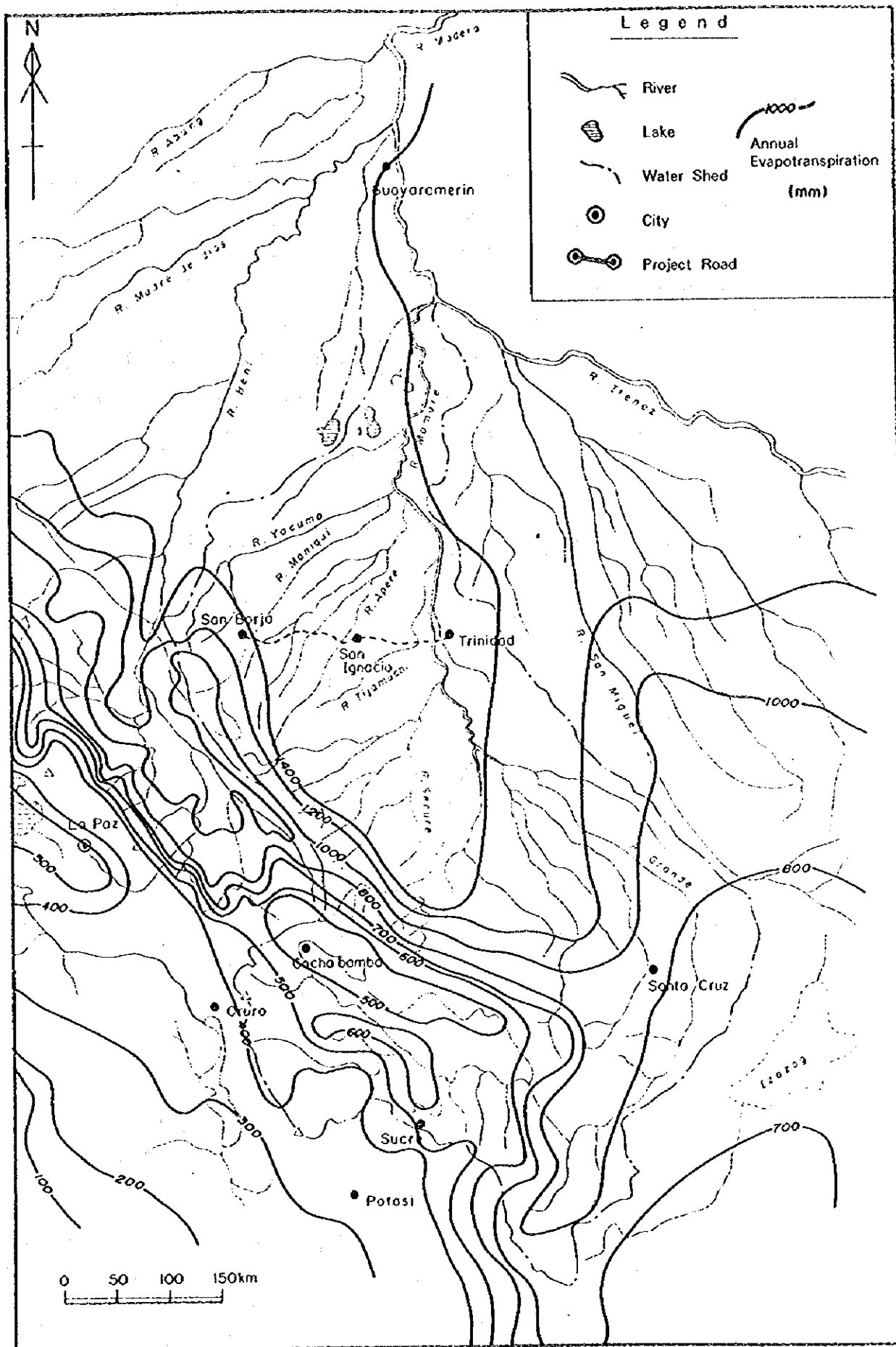


Figure 2-1-5 Evaporation in Bolivia

2.1.4 Land Use

The land use around the objective area is shown in Figure 2-1-5, which is based on a LANDSAT image. Most of the southwestern part of the objective area is covered with forest, except either side of the San Borja-Trinidad road; however, most of the other land is covered with grassland.

According to the INE (National Institute of Statistics), the existing land , which represents 54% of the total, is used mostly for pasture as shown in Table 2-1-1. Most of the grassland indicated in Figure 2-1-6 is believed to be used as pasture.

Table 2-1-1 Existing Land Use

Land Use	Area (km ²)	Percentage
Pasture	115,325	54.00
Rivers, Lakes, Ponds, etc.	12,814	6.00
Communities, Villages	4,698	2.20
Roads	6,001	2.81
Rubber Development	14,949	7.00
Cacao Development	8,534	4.00
Timber Development	13,882	6.50
Agricultural Field	17,085	8.00
Forest (Unused)	7,454	3.49
Others	12,822	6.00
Total	213,564	100.00

Source: INE

Between San Borja and Trinidad there are some conservation areas, like the Biological Station of Beni, Yacuma National Park, Chimane's conservation area, etc., as shown in Figure 2-1-7.

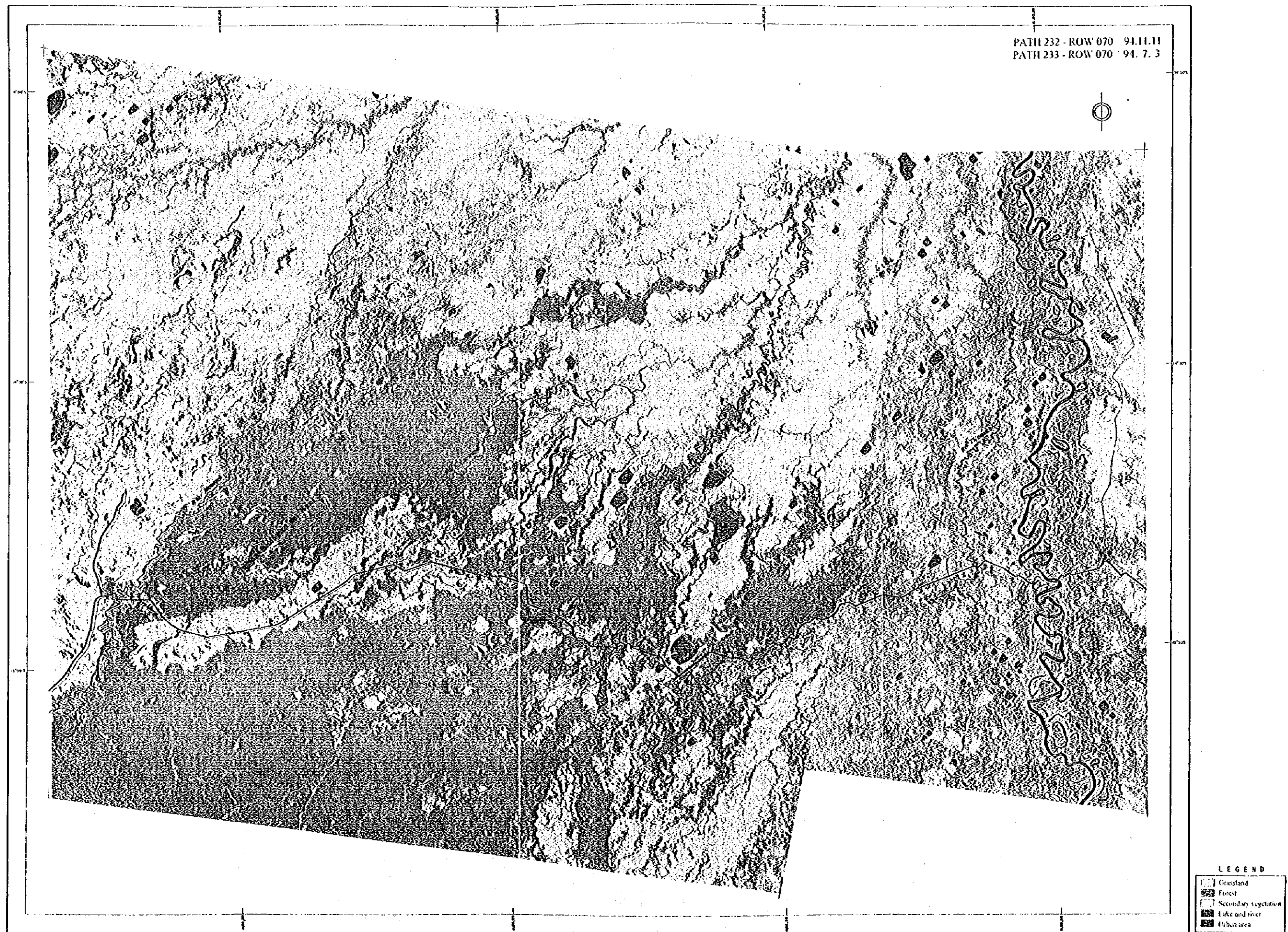


Figure 2-1-6 Land Use Map of the Study Area

Figure 1 is a line graph showing the percentage of total energy expenditure (TEE) for different activities over a 24-hour period. The Y-axis is 'Percentage of TEE' (0-100) and the X-axis is 'Time of Day' (0-24). The activities and their approximate percentages are:

Time of Day	Sleeping	Resting	Sitting	Standing	Walking	Running
0	80	10	5	0	0	0
4	80	10	5	0	0	0
8	70	15	10	0	0	0
12	60	20	15	0	0	0
16	50	25	20	0	0	0
20	40	30	25	0	0	0
24	80	10	5	0	0	0

2.2 Social and Economic Conditions

2.2.1 Population

According to a census taken in 1992, the population in the whole country is 6.42 millions, which is an increase of 1.39 times (an annual average growth rate of 2.1%) compared with 4.61 millions people counted in the last census carried out in 1976. Of all the departments, as shown in Table 2-2-1, Santa Cruz showed the highest growth rate of 4.2%; however, Potosi registered a negative growth because of the decline of its mining industry. On the other hand, the population of the Beni department, including the objective area of this Study, increased from 168,000 inhabitants in 1976 to 276,000 inhabitants in 1992, with an average growth rate of 3.1%, which was higher than the national average growth rate of 2.1%. Within the Beni Department, Vaca Diez and Ballivian showed more than a 4% annual growth rate, as shown in Table 2-2-2.

Table 2-2-1 Population by Department

Department	1976	1992	A.G.R.(%)
La Paz	1,465,078	1,900,786	1.6
Oruro	310,409	340,114	0.6
Potosi	657,743	645,889	-0.1
Cochabamba	720,952	1,110,205	2.7
Chuquisaca	358,516	453,765	1.5
Tarija	187,204	291,407	2.8
Pando	34,493	38,072	0.6
Beni	168,367	276,174	3.1
Santa Cruz	710,724	1,364,389	4.2
Total	4,613,486	6,420,801	2.1

Source: INE

Table 2-2-2 Population by Province

Province	1976	1992	A.G.R.(%)
Cercado	35,172	63,128	3.7
Vaca Diez	42,586	84,651	4.4
Ballivian	24,789	47,420	4.1
Yacuma	15,714	25,068	3.0
Moxos	15,028	17,602	1.0
Marban	11,578	11,950	0.2
Mamore	9,349	10,055	0.5
Itenez	14,401	16,300	0.8
Total	168,617	276,174	3.1

Source: INE

2.2.2 Economy

(1) Past Economic Trends

The Bolivian economy registered a negative economic growth rate until 1986. Since then, however, the Bolivian economy has been growing at the rate of 2% to 4%. In 1993 the growth rate was 3.2%, as shown in Table 2-2-3. This Table also shows the major economic indicators in Bolivia. The main characteristics are summarized as follows:

- a) The GNP per capita in 1992 was US\$680. According to a classification of economies by income of the Development Assistance Committee (DAC), Bolivia is second from last among the group of middle income economies (per capita income ranging between US\$676 and US\$8,355). Even among the Central and South Latin-American countries, Bolivia's per capita income is the lowest, next to Nicaragua.
- b) The rate of the consumer price reached 11,749.6% in 1985; however, since then it decreased to 10 %, except in 1991. Therefore, in terms of inflation, Bolivia is a comparably stable country by Latin American standards.
- c) The current revenue and expenditure deficit had a decreasing tendency at one time; however, since 1991 it has been increasing because recently imports have exceeded exports. In 1993 the deficit registered US\$53.3 billion.
- d) The debt accumulation for foreign countries has remained at a level of US\$40 billion; however, the debt service ratio has been increasing because of the decrease in exports.

Table 2-2-3 Major Economic Indicators

Items	1988	1989	1990	1991	1992
Nominal GDP (Million Bs)	11,791	13,925	16,937	20,915	23,520
Growth Rate (%)	2.80	2.70	2.50	4.10	3.88
Nominal GDP (Million US\$)	4310	4520	4480	5019	5270
Per Capita GDP (US\$)	570	620	630	650	680
Current Rev. & Expenditure (Million US\$)	-306	-264	-194	-262	-533
Rate of Consumer Price Increase (%)	16	15.2	17.1	21.4	12.1
Foreign Debt Accumulation (Million US\$)	4451	4359	4276	4075	4243
Exchange Rate (Boliviano/US\$)	2.47	2.98	3.4	3.75	4.1
Debt Service Ratio (%)	32.9	31.3	39.8	34	39

Source: "Bolivia - Recent Economic Development" (IMF)

(2) Financial Situation

According to "Bolivia-Recent Economic Development" (IMF), the financial situation of the central government has consistently shown a deficit, as shown in Table 2-2-4. However, the rate of the deficit of the GDP has gradually decreased because of the tight financial policy adopted for the purpose of reaching a sound financial state.

Table 2-2-4 Financial Situation of the Central Government

Items	1988	1989	1990	1991	1992
Revenue	2,167	2,738	3,571	4,713	5,630
% of GDP	20.9	22.6	25.0	26.0	26.5
Expenditure	2,843	3,407	4,159	5,354	6,259
% of GDP	27.4	28.1	29.1	29.7	30.4
Balance	-679	-669	-588	-641	-665
% of GDP	-6.5	-5.5	-4.1	-3.6	-3.2

Source: INE

(3) Exports and Imports

Table 2-2-5 shows Bolivia's exports and imports. Since 1988 exports have exceeded imports; however, in 1991 imports once again exceeded exports. In 1992 the trade deficit expanded because of the big slump of natural gas exports. Additionally, imports also increased due to a liberalization of import policy and an increase in the number of intermediate goods due to the recovery of business conditions.

Table 2-2-5 Exports and Imports

Items	1988	1989	1990	1991	1992
Exports (FOB)	600	822	927	847	710
Imports (CIF)	591	620	703	994	1,169
Exports to Japan	9	11	9	11	12
(Share %)	1.5	1.3	1	1.3	1.7
Imports from Japan	70	52	69	122	144
(Share %)	11.8	8.4	9.8	12.3	12.3

Source: INE

(4) Economy of the Beni Department

Table 2-2-6 shows the economic situation of the Beni department. The RGDP in the Beni department reached its highest level in 1990 (Bs.660 million); however, since then it gradually decreased until 1992 (Bs.850 million). In terms of economic activities, the livestock industry represents 26.4% of the total RGDP, followed by manufacturing with a 18.5%.

Table 2-2-6 Economic Activities in the Beni Department

Activity	1988	1989	1990	1991	1992 (p)
A. INDUSTRIES	724,944	780,238	801,145	793,296	797,936
1. Agriculture, hunting, forestry and fishing	297,795	330,994	339,827	344,937	349,861
- Non-industrial agricultural products	31,728	36,811	38,071	40,856	39,534
- Industrial agricultural products	1,019	7,129	4,032	1,180	3,862
- Husbandry products	207,196	225,655	225,044	229,166	224,547
- Forestry, hunting and fishing	57,852	81,399	72,680	73,735	81,918
2. Metallic and non-metallic minerals	19,024	21,278	26,696	9,347	9,814
3. Manufacturing industries	148,223	149,769	151,316	154,038	156,937
4. Electricity, gas and water	3,247	4,049	5,138	3,064	3,375
5. Construction and public works	18,119	34,015	33,354	31,262	24,026
6. Commerce	136,222	136,094	138,865	142,192	142,663
7. Transportation and storage	37,886	38,283	38,949	39,657	40,406
8. Communications	5,331	5,828	5,957	6,527	7,202
9. Financial establishments, insurance, real estate and services rendered to companies	43,873	44,630	45,630	46,589	47,382
- Financial services *1	---	---	---	---	---
- Services for companies	4,834	4,904	5,028	5,219	5,328
- Housing properties	39,039	39,726	40,602	41,370	42,054
10. Common, social and personal services	5,317	5,361	5,378	5,532	5,694
11. Restaurants and hotels	9,908	9,937	10,035	10,151	10,576
- Assigned banking services *1	---	---	---	---	---
B. PUBLIC ADMINISTRATION SERVICES	55,095	56,704	57,980	56,276	49,545
- Central administration	40,043	39,992	40,575	40,498	34,998
- Local and regional administration	7,976	6,730	6,592	4,636	5,966
- Social security system	3,395	4,097	3,315	4,318	3,894
- International aid	3,681	5,886	7,498	6,824	4,687
C. DOMESTIC SERVICE	1,986	2,064	2,128	2,188	2,244
TOTAL	782,025	839,006	861,253	851,760	849,725

Notes: (p) : Preliminary

*1 : Financial and banking services were not divided into regions.

Source: INE

2.2.3 Road Condition

National Road No.3 is a major trunk road with an overall length of 595 km. The road runs northeast from La Paz to San Borja, then from San Borja it turns eastward to Trinidad. National Road No.3 can be divided in two sections: (1) a steep mountainous section from La Paz, which crosses the major eastern ridge of the Andes and then passes through Caranavi on its way to Yucumo; and (2) a flat section from Yucumo, crossing "Pampa" and "Bosque" (woods) and then passing through San Borja and San Ignacio on its way to Trinidad. The study road is 230 km from San Borja to Trinidad, of which the difference in elevation is a mere 40 m (1:5,750).

The present existing section of road between San Borja and Trinidad (completed in 1976) was constructed using earth embankments measuring 0.3 - 3.0 m on either side. The road surface consists of clay and ruts may be found everywhere because the clay road cannot support vehicle loads; the shoulder of the road has also collapsed in many

places. The road is 9.0 m in its widest part; however, there are some locations where the vegetation has grown into the road and only one lane is passable. Rivers and streams intersect the present road in many places and pontoons are utilized to cross the larger watercourses. Medium-sized and small river sections or places with insufficient drainage facilities are provided with wooden bridges or corrugated pipes.

During the rainy season, the road section 40-50 km west of Trinidad is mostly under water and is, of course, impassable. Depending on the year, these periods often last from 5 to 6 months. Water traffic replaces road traffic, utilizing the drainage channels created by the side borrows.

The section of road between San Ignacio and San Borja does not experience flooding; however, when water discharge increases, there is an overflow and the corrugated pipes are carried away. Consequently, the road erodes. Even in the dry season, road surface conditions are poor and vehicles must keep their speeds at under 30 km/h.

2.2.4 Traffic Volume

The traffic volume in the three sections of the road between San Borja and Trinidad is summarized in Table 2-2-7. The section between Trinidad and Puerto Ganadero has the largest traffic volume because commodities unloaded at ports are transported to Trinidad. However, the traffic volume decreased from 1981 to 1984 over these three sections, due to economic difficulties. In 1982 and 1984 the Western area from Puerto Ganadero was severely damaged by great floods, which greatly decreased the traffic volume in the section between San Ignacio and Puerto Ganadero.

Table 2-2-7 Traffic Volume on the Road Between San Borja and Trinidad
(Unit : vehicles)

Year	From San Borja to San Ignacio	From San Ignacio to Puerto Ganadero	From Puerto Varador to Trinidad
1985	69	74	286
1986	15	31	229
1987	96	93	155
1988	65	76	290
1989	37	36	260
1990	44	44	324
1991	60	71	218
1992	77	57	338
1993	74	72	399
1994	80	71	416

Source: SNC

CHAPTER 3

LEGAL ASPECTS

CHAPTER 3 LEGAL ASPECTS

3.1 Laws and Regulations Related to the Environment

3.1.1 List of Laws and Regulations

There are many environmental laws and regulations in Bolivia. The following is a representative list of these. The contents of these laws are summarized briefly in Appendix 4.

(1) General Framework of Bolivian Legislation Related to the Natural Environment

Table 3-1-1 List of General Framework of Bolivian Legislation Related to the Natural Environment

No.	Contents of Laws/Regulations	Name of Laws/Regulations
1	Political Constitution of the State	S.D. dated February 1967, and modified by Law 1585 dated August 12, 1994
2	Natural Environmental Law (Modified by Law of Ministries of the Executive)	Modified by the Ministries Law of the Executive Law 1333 dated April 27, 1992
3	Forest Regulations (Abrogated by several by-laws) (abrogated by several Legal Provisions)	Decree August 2, 1939
4	Law of Dominion and Utilization of Water (Abrogated and modified)	Law dated November 28, 1906 S.D. dated September 8, 1989
5	Forest Direction of Hunting and Soil Conservation (Abrogated)	S.D. 3612 dated January 22, 1954
6	Lien for the Trade of Forest, Hunting and Fishing Products (Abrogated)	S.D. 08063 dated August 16, 1967
7	Rules Related to Violations on Natural Renewable Resources (Abrogated)	S.D. July 23, 1979
8	Defense Committees for Flora and Fauna	S.D. 10127 dated February 18, 1972
9	Center of Forest Development (CDF) (Modified by Forest Law and Others)	S.D. 1103 dated August 17, 1973
10	General Forest Law of the Nation	L.D. 11686 dated August 13, 1974
11	Wild Life, National Parks, Hunting and Fishing Law	S.D. 12301 dated March 14, 1975
12	Development Committee of the Biological Sciences	S.D. 12982 dated October 22, 1975
13	Regulation of the General Forest Law of the Nation	S.D. 14459 dated March 25, 1977
14	General Indefinite Closed Season for Hunting and Fishing	M.R. 221/86 dated June 9, 1988
15	Organic Law of Municipalities	Law of January 10, 1985, and amendments of Law 113 dated October 19, 1989
16	CDF - Auction of Confiscated Animal Skins	S.D. 22641 dated November 11, 1990
17	Ecological Pause - Forest Sector	S.D. 22407 dated January 11, 1990
18	Fishing and Aquaculture Regulation	Appendix of the S.D. 22581 dated August 14, 1990
19	National Fund for the Natural Environment (Amended by the Environmental Law)(FONAMA)	S.D. 22674 dated December 12, 1990
20	General Secretary of the Natural Environment (abrogated Law of the Ministries of the Executive)	S.D. 22710 dated January 18, 1991
21	Statutes of the Regional CDFs	S.D. 22763 dated March 28, 1991
22	Rule of the Ecological Pause	S.D. 22884 dated August 3, 1991
23	Regulation of the Protected Areas Issue	M.R. 1294 dated March 12, 1994
24	Law of Ministries of the Executive	Law 1493 dated September 17, 1993
25	Regulation of the Law of the Ministries of the Executive	S.D. 23660 dated October 12, 1993
26	Popular Participation Law and Regulations	Law 1551 dated April 20, 1994, and S.D. 23858 dated September 9, 1994
27	National Secretary of Popular Participation	S.D. 23792 dated May 31, 1994

(2) Natural Protected Area

Table 3-1-2 List of Bolivian Legislation Related to the Natural Protected Area

No.	Contents of Laws/Regulations	Name of Laws/Regulations
28	National Amazon Reserve of Manuripi Health	1. L.D. 7044 dated January 30, 1961 2. S.D. 14119 dated November 15, 1976 3. L.D. 11257 dated December 20, 1973
29	National Reserve of the Beni and Pando Lagoons	1. S.D. 5912 dated October 27, 1961 2. S.D. 5987 dated January 26, 1962
30	National Park Isidoro Secre	1. S.D. 7401 dated November 22, 1965 2. M.R. 118-89 dated May 24, 1989 3. M.R. 161/8 dated May 24, 1989 4. RR CDF-RN 12/90 dated April 27, 1990 5. S.D. 22610 dated September 24, 1990
31	Amboro National Park	1. S.D. 11254 dated December 20, 1973 2. S.D. 20423 dated August 16, 1984 3. S.D. 22939 dated October 11, 1991
32	Shelter of Wild Life Farms Elsner Espiritu and San Rafael	
33	National Park Noel Kempff Mercado	1. S.D. 16646 dated June 28, 1979 2. Law 978 dated March 4, 1988 3. S.D. 21997 dated August 31, 1988 4. S.D. 22231 dated June 23, 1989
34	Biosphere Reserve - Biological Station of the Beni	S.D. 19191 dated October 5, 1982
35	Reserve of the Biosphere - Indigenous Territory Pilon Lajas	S.D. 23110 dated April 9, 1992
36	Santuario Caverns of Repechón	M.R. 157/86 dated May 22, 1986
37	Protection Zone of Hydrographical Basins Eva Mosetenes	R.R./C.D.R.-N/No. 02/87 dated February 23, 1987
38	Regional Park Yacuma	RR CDF-RN 01/87 dated February 11, 1987
39	Biological Reserve Noel Kempff Mercado	S.D. 22020 dated September 19, 1988
40	National Park Carrasco	1. R.M. 381/88 dated December 9, 1988 2. S.D. 22940 dated October 11, 1991
41	Reserve of Wild Life of the Blanco and Negro Rivers	M.R. 139/90 dated August 10, 1990
42	MACA CDF and Prodena-Bolivia Agreement dated July 22, 1986	

(3) Forest Reserves

Table 3-1-3 List of Bolivian Legislation Related to Forest Reserves

No.	Contents of Laws/Regulations	Name of Laws/Regulations
43	Guarayos Forest Reserve	1. S.D. 8660 dated September 12, 1969 2. S.D. 11615 dated July 2, 1974 3. S.D. 12268 dated February 28, 1975
44	Forest Reserve Bosques de Aliso	S.D. 11212 dated December 5, 1973
45	Forest Reserve Quinera Del Aten	S.D. 14686 dated June 23, 1977
46	Immobilization Forest Reserve Chiquitana	1. S.D. 14928 dated September 22, 1977 2. S.D. 15500 dated May 26, 1978
47	Immobilization Forest Reserve Río Grande Masicuri	S.D. 17004 dated August 2, 1979
48	Immobilization Forest Reserve Boopi River	S.D. 17005 dated August 2, 1979
49	Immobilization Forest Reserve Covendo	1. D.S. 20649 dated December 12, 1984 2. D.S. 21040 dated August 1, 1985
50	Immobilization Forest Reserve Itenez	S.D. 21446 dated November 29, 1985
51	Forest Reserve of Production Bajo Paragua	1. D.S. 22024 dated September 19, 1988 2. R.M. 139-90 dated August 10, 1990
52	Immobilization Forest Reserve Itunualde	S.D. 23022 dated December 23, 1991

(4) Fiscal Reserves

Table 3-1-4 List of Bolivian Legislation Related to Fiscal Reserves

No.	Contents of Laws/Regulations	Name of Laws/Regulations
53	Fiscal Reserve	1. S.D. 05711 dated February 24, 1961 2. S.D. 09009 dated September 27, 1969 3. S.D. 13163 dated December 10, 1975

(5) Ethnic Groups

Table 3-1-5 List of Bolivian Legislation Related to Ethnic Groups

No.	Contents of Laws/Regulations	Name of Laws/Regulations
54	Indigenous Area Chimanes	1. S.D. 15508 dated May 26, 1978 2. S.D. 15585 date June 27, 1978 3. S.D. 21483 dated December 19, 1986 4. RR CDF-RN 01/87 dated February 11, 1987 5. S.R. 205862 dated February 17, 1989 6. MR 34/89 dated February 22, 1989 7. MR 58/89 dated March 21, 1989 8. MR 100/89 dated May 5, 1989 9. S.D. 22611 dated September 24, 1990
55	Bolivian Indigenous Institute	S.D. 22503 dated May 11, 1990
56	Commission for the Drafting of the Law Project of the Indigenous People of the East and Amazon Region	S.D. 22612 dated September 24, 1990
57	Water of Rural Tax	S.D. 22588 dated August 30, 1990
58	Multiethnic Indigenous Territory	S.D. 22611 dated September 24, 1990
59	Chiman Indigenous Territory	S.D. 22611 dated September 24, 1990
60	Siriono Indigenous Territory	S.D. 22609 dated November 24, 1990
61	Program of Bilingual Intercultural Education	S.D. 2303 dated January 28, 1992
62	Indigenous Forest Guard	S.D. 23107 dated April 9, 1992
63	Yuqui Indigenous Territory	S.D. 23111 dated April 9, 1992
64	Chiquitano Indigenous Territory	S.D. 23113 dated April 9, 1992
65	Araona Indigenous Territory	S.D. 23108 dated April 9, 1992
66	Constitutive Agreement of the Fund for the Development of the Indigenous Communities of Latin America and the Caribbean	Law 1468 dated February 18, 1993
67	Weenhayek (Mataco) Del Gran Chaco Indigenous Territory	S.D. 23500 dated April 19, 1993

(6) Other Legal Provisions Related to the Natural Environment

Table 3-1-6 List of Other Legal Provision Related to the Natural Environment

No.	Contents of Laws/Regulations	Name of Laws/Regulations
68	Organization and Procedures of the Service of National Agricultural Reform Law (SNRA)	L.D. 10397 dated July 31, 1952
69	Colonization Law	L.D. 07765 dated July 31, 1966
70	Bolivian Tourism Institute	S.D. 10702 dated January 25, 1973
71	Intervention of the National Council of Agricultural Reform	1. S.D. 23331 dated November 24, 1992 2. S.D. 23418 dated March 10, 1993
72	Non Traditional Basic Products	Law 694 dated December 30, 1984
73	Mining Code	Law 1243 dated April 11, 1991

(7) Provisions of International Law

Table 3-1-7 List of Provisions of International Law

No.	Contents of Laws/Regulations	Name of Laws/Regulations
74	Amazon Cooperation Treaty	1. L.D. 16811 dated July 19, 1979 2. Treaty of Amazon Cooperation and Development Brasilia July 3, 1978 3. Permanent National Commission of Amazon Cooperation S.D. 17996 dated February 5, 1981
75	Tropical Wood International Agreement	Law 867 dated May 27, 1986
76	Meeting on International Trade of Threatened Species of Wild Fauna and Flora	Law 1255 dated July 5, 1991
77	Agreement 169 Indigenous and Tribe Communities in Independent Countries	Law 1257 dated July 11, 1991
78	Agreement on Biological Diversity	Law 1580 dated June 15, 1994
79	Cartagene Agreement	
80	Constitutive Agreement of the Development Fund of the Indigenous People of Latin America and the Caribbean	Law 1468 dated February 18, 1993
81	Amazon Cooperation Agreement	Law 1572 dated July 12, 1993
82	Framework Agreement of Cooperation between the Cartagena Agreement and its Member Countries with the European Economic Community	Law 1566 dated July 12, 1994

3.1.2 General Provisions

Bolivian legislation has as its a main source of environmental legislation, the Natural Environment Law dated April 1992, which was the starting point for dealing with environmental issues in a global and systematic way. This does not, however, mean that in the past there were no legal provisions regulating the use of natural resources and protecting wildlife. On the contrary, a variety of such laws were passed during the entire Republic Period. However, these provisions did not have a general view of the natural environment, rather these laws dealt only with particular and isolated matters.

Besides the above mentioned, there are other legal provisions, whose objective is not specifically the natural environment, natural resources or wildlife, but which, nevertheless, are very relevant to the conservation of the natural environment.

Taking into account the above mentioned and given the request of JICA, Bolivian natural environment legislation useful for the evaluation of the environmental impact of the Yucumo-Rurrenabaque road was compiled, and for practical reasons has been classified as follows: general framework of Bolivian environmental legislation, legislation of natural protected areas, forest reserves, fiscal reserves, ethnic groups, other provisions of environmental relevance, and provisions of international law.

This document shall analyze various specific important aspects of the above-mentioned legislation, with the purpose of demonstrating in a general way how Bolivian Legislation deals with different environmental areas.

The Political Constitution of the State of 1967, reformulated in 1994, makes no mention of specific regulations dealing with the natural environment; however it is possible to find relevant principles and rules, such as the following: the Constitution of Bolivia is unitary, free, and adopts representative democracy as its form.

The right of people to have a healthy natural environment, introduced by the Natural Environment Law, is not included in the Constitution as a fundamental right, although rights to life, health and security are recognized.

The same fundamental rule indicates that the soil and subsoil with all their natural resources, lakes, rainy and medicinal water, as well as the elements and physical forces are original dominion of the State besides other things granted by law, and it gives the State the responsibility to regulate the exploitation of natural resources, to ensure their conservation and increase.

Regarding ethnic groups, the State recognizes, respects and protects the social, economic and cultural rights of the indigenous peoples, especially those rights related to their community lands, guaranteeing the use and sustained utilization of natural resources. It also recognizes the legal personalities of the indigenous and peasant communities.

Natural Environment Law 1333 states for the first time in the history of Bolivian Legislation a global point of view with respect to the natural environment. It is possible to determine the need to incorporate environmental policies into other national policies, in order to seek a sustained development. It establishes the rights of individuals to a healthy and clean natural environment for the development and exercise of their activities, the improvement of the quality of life, and the right to information about the natural environment.

It develops the following general principles:

- Preservation through the evaluation of environmental impact and planning.

- Protection and conservation of the natural environment which, as a whole, is the patrimony of the State.
- Promotion of the conservation of biodiversity.
- Most advantageous and rational use of water, air, soil, etc.
- Introduction of an environmental dimension, and environmental education in the processes of national development.
- Promotion and development of scientific and technological investigations of the environment.
- Territorial order through ecological, economical, social and cultural research.
- Participation of citizens in matters related to the environment through petitions and notices.
- Civil liability for damages caused to the natural environment.

The Natural Environment Law has not been applied as a whole due to a lack of procedures. At the present, regulations are being prepared to solve part of this problem, and to assist in the application of the rules. Drafts of specific laws are being prepared on issues such as: conservation of biological diversity, forest regime, waters, and territorial order.

3.1.3 Institutional Framework

In 1991, the first step was taken in the Constitution with the implementation of a specific constitutional framework for the natural environment, with the creation of the General Secretary of the National Environment (SEGMA), under the Presidency of the Republic, as an organism to control, formulate and execute environmental policies, and advance programs and projects to improve the natural environment. This legal provision was in effect until Natural Environment Law 1333 was approved in 1992, creating the National Secretary for Natural Environmental (SENMA), which is in charge of environmental issues, and provides regulations and provisions, and the direction of the national policy of natural environment, besides planning, coordinating, evaluating and controlling all environmental activities. At the same time, it is stated that the ministries, public organisms and institutions of national, departmental and local character dealing with the environment must adjust their organizational structures, in order to have an office that deals specifically with issues related to the natural environment, which will coordinate directly with SENMA.

The same Law provides for the creation of Departmental Councils of the Natural Environment (CODEMA) and Departmental Secretaries of the Natural Environment as decision-making organisms, capable of advising on and defining policies at a departmental level. With the approval of the Law of Ministries of the Executive of 1993, the above-mentioned institutional framework has been substantially amended, with the creation of a strong organism in charge of environmental issues and general national planning, the Ministry of Sustained Development and Natural Environment (MDSMA), which consists of two national secretaries: the National Secretary of Planning and the National Secretary of Natural Resources and Environmental Issues.

The latter is in charge of establishing the mechanisms for the rational utilization of natural resources and to encourage the Environmental Issue. This organization is divided into three Undersecretaries:

- Undersecretariat of Environmental Quality, responsible for controlling compliance with the environmental rulings, assuring its protection.
- Undersecretariat of Natural Resources, in charge of ensuring the rational utilization of natural resources.
- Undersecretariat of Environmental Promotion, responsible for promoting environmental education and popular participation.

The same organization states that the undermentioned institutions must be under the Ministry of Sustainable Development: National Fund of Natural Environment (FONAMA), National Institute of Statistics (INE), National Service of Meteorology and Hydrology (SNMH), National Institute of Colonization (INC), National Council of Agricultural Reform (CNRA), Executive Program of Land Rehabilitation of Tarija (PERT), Service of Pirai River (SEARPI), Special Project of Titicaca Lake (PELT), National Museum of Natural History (NMHN) and Center of Forest Development (CDF).

Related authorities dealing with environmental issues at a departmental level have not yet been named. This problem will be solved with the approval of the Decentralized Administrative Law and application of the Natural Environment Law.

At a local level, municipal government are expected to preserve the natural environment, control pollution, and maintain the ecological equilibrium in coordination with the Executive Power (Organic Law of Municipalities).

3.1.4 Renewable Natural Resources

Regulations on renewable natural resources date from the beginning of the Republic Period. These provisions focus on the protection of natural resources in an isolated way. Thus protection rules aimed at selected species of flora and fauna are found without considering their interrelation with other environmental aspects that would help provide complete and efficient protection.

Over the last fifty years, and especially during the '70s, important legal provisions were approved regarding the utilization and protection of natural resources. Unfortunately, they were not part of an overall policy and did not have the necessary ruling for their correct application. Among these provisions are a Decree dated August 2, 1939, which establishes some rules for forest exploitation; the Law of Dominion and Utilization of Waters at the beginning of the century; Decree 3612 of 1954, which created the Direction of Hunting and Soil Conservation; Decree 8063 dealing with taxes on the trade of forest, hunting, and fishing products; Decree 9328 of 1970, which regulates all matters related to violations of natural resources; Decree 10127 of 1972, which created the Committees of Defense of Flora and Fauna; Decree of 1973, which created the Center of Forest Development; Decrees 11686 and 14459, which approved the Forest Law of the Nation and its regulations; Decree 12301 of 1975, which approved the Law of Wild Life, National Parks, Hunting and Fishing.

At the beginning of this decade and as a prior step to approval of the Natural Environment Law, a closed season on hunting and fishing was declared for an indefinite period through Decree 22641. Later on, the Historic Ecological Pause was approved together with its regimentation through Decrees 22407 and 22884, by-laws of the forest development centers were approved, and the Ruling for fishing and agriculture was set forth.

The Natural Environment Law dedicates a complete section to renewable natural resources in general; and specifically, includes chapters on water, air, soil, forests, forest lands, wild flora and fauna, protected areas, and agricultural activities.

The general principles established for natural resources are as follows:

- Natural resources are patrimony of the Nation.
- It is a duty of the State and of society to preserve, conserve, restore, and promote the use of natural resources.
- Private people have the right to utilize the natural resources in a sustained manner, respecting the collective interest.
- Utilization must take into account regional potentialities and other aspects, besides the characteristics of the resources.
- Integral management of hydrological basins.
- Utilization of natural resources according to management plans.
- Industrialization will aim at utilizing extracted products in an integral manner, diversifying the production of goods and increasing the added value of exports for the benefit of the nation as a whole.
- The use of natural resources will be determined by law.

Bolivia has subscribed and ratified several treaties and international agreements related to the conservation of natural resources. Among these are the following: Amazon Cooperation Treaty (Brasilia, July 3, 1978); International Trade of Tropical Woods Agreement (Office of the United Nations, November 1, 1986); Meeting on International Trade for Threatened Species of Wild Flora and Fauna (Washington, May 1973); Meeting on Biological Diversity (Rio de Janeiro, June 10, 1992); Cartagena Agreement; Meeting of Amazon Cooperation (Ilo Peru, July 30, 1993); Framework of Cooperation Meeting between Cartagena Agreement and their Member countries with the European Economic Community (Copenhagen, Denmark April 23, 1993.)

3.1.5 Wild Flora and Fauna

The National Environmental Law establishes the principles for the protection, conservation, and restoration of wild flora and fauna, both aquatic and terrestrial.

- All species are the patrimony of the State, particularly endemic species with a restricted distribution, or those that are threatened or in danger of extinction.
- Encouragement to research programs and evaluation of wild fauna and flora in order to learn their true value in every sense.
- Sustained management of species of wild flora and fauna for their utilization.
- Protection of biodiversity and the integrity of the genetic patrimony of wild flora and fauna, as well as domesticated species.
- Authorizations for hunting, recollection, extraction, trading of species and products, as well as the opening and closing of seasons for hunting and fishing, shall be processed through the corresponding authorities.

At present, the Law of Wild Life, National Parks, Hunting and Fishing is partially in effect, establishing regulations regarding all matters related to wild fauna. The Executive Power is in charge of this law through the CDF. It determines cases for prohibitions, zones and declarations of closed seasons for fishing and hunting, as well as methods and systems of hunting.

The background for these legal provisions are found in the Decree dated August 2, 1939, which sets out the guidelines for creating protected areas for the conservation of flora and fauna; Decree 3612 dated January 22, 1954, which creates the Forest Direction for Hunting and the Conservation of Soil under the Ministry of Agriculture, Cattle and Colonization, which is in charge of the conservation, encouragement, exploitation, industrialization, and economic utilization of renewable economic resources; Decree 8063 dated August 16, 1967, which sets forth taxes on the trading of wood, hunting and fishing products; Decree 9328 dated July 23, 1970, which regulates all matters related to violations in the area of renewable natural resources; Decree 10127 dated February 18, 1972, which creates flora and fauna defense committees at a Departmental level, and which consists of distinguished persons in the community.

In 1990, the Decree 22641 dated November 8 of the same year, declared an indefinite closed season for hunting and fishing, as a consequence of the signing of the Meeting CITES, which sets forth a prohibition on capturing, pursuing, and conditioning wild animals and their products, allowing this kind of activities only and exclusively to scientific research based on agreements or legal results duly subscribed. The time for the closed season for hunting and fishing can only be ended by a Supreme Decree for each species. The transport of wild flora and fauna and their products is strictly forbidden.

The regulation of the ecological pause prohibits the hunting of wild fauna for trade in forest areas, and obliges forest enterprises to provide meat to their workers.

Provisions regulating the protection of wildlife do not emphasize the need to protect the habitats of the wild species. Rather, they refer only to the capture of wildlife.

There are several internationally confirmed provisions, which were already mentioned in the chapter on natural resources in general.

3.1.6 Forestry Regime

Regarding forestry resources, several rules and regulations have been set forth, intended to promote the utilization of these resources in a rational manner. Unfortunately, forest exploitation has focused on the exploitation of the most lucrative species in the market, leaving aside other types of exploitation and uses with negative effects on the forests, such as deforestation and impoverishment of the soil.

Of the various old laws (already abrogated) dealing with forest resources, one of the most complete was Supreme Decree S.D. dated August 2, 1939, which prohibited the cutting of various types of trees and established regulations for the exploitation and cutting of trees. It established obligatory reforestation, created a day dedicated to trees, encouraged tree planting, and provided the possibility of declare fiscal reservation zones as well as national parks. It created the first National Park of Sajama, aimed at protecting the Keñua forests. Later on, S.D. 3612 dated January 22, 1954, created the Direction of Hunting and Soil Conservation, specifying the lands and forests under forestry control, regulating forestry rates, and authorizing the building forestry districts needed by the country. The breach regulation on natural resources punished the actions of illegal trade and forest fires.

S.D. 1103 of 1973, created the Center for Forestry Development, aimed at stating the nation's forestry policy, as well as managing and legislating forest matters. This institution has continued operating although its structures and functions have been partially changed.

The Forest Law of the Nation approved by L.C. 11686 dated August, 1974, promotes, regulates and controls the utilization, trade, industrialization, protection and conservation of the forestry resources in order to achieve the development of the sector in a manner benefiting the country. It is based on the following premises:

- Forests and lands belonging to the State are the patrimony of the State, and are to be utilized for the benefit of the public.
- Rational utilization and trade are in the public interest.
- Two forestry regimes are set forth: one related to protection and the other related to production.
- Registration of forestry enterprises.
- Provides the CDF with the power to declare partial, total, temporary or indefinite prohibitions regarding the utilization of forests.
- Treatment or rehabilitation of public or private lands affected by the advanced exhaustion of natural fertility, compacting, or threatened by erosion one, aspect of which is of public interest and therefore subject to expropriation or reversion.
- Provides the CDF with the power of control, application, and prevention regarding forest fires and their extinction.
- Calls for the adoption of precautions when clearing land by burning.
- Control and prevention of plagues and forest diseases.
- The import of seeds is regulated by the CDF.
- Curtains and windshields of permanent public interest, and protection and promotion of the creation of green areas in the country.
- Obligation to protect vegetation and forests.
- Fixing of minimum percentages for colonization areas and agricultural properties as natural forest covers, in order to avoid indiscriminate land burning.
- Natural vegetation on hills or slopes equal or greater than 45% come under permanent protection.
- Promotion of forestry commercial plantations.
- Confirms the creation of the CDF as an independent and decentralized entity, with management, monitoring, regulation, and promotion faculties.

- Restructuring of National Forest Keepers or Rangers.
- Establishes the Forest Keepers School.
- Recognizes 11 types of industries.
- Special credits and fiscal stimulations for enterprises developing forestry industrialization and repopulation programs.

The Natural Environmental Law devotes one chapter to forest lands and forest woods, making the following statements:

- Forest lands and woods are originally the patrimony of the State.
- Their use and management shall be sustained.
- The need to appraise forests, subject to management and conservation plans.
- The rules for using and managing forestry resources, as well as their classification according to aim, shall consider conservation, protection and production aspects.
- Encouragement of forestry research and industrialization.
- Integral management of forests.
- The forestry industry shall be oriented toward the national interest.
- Replacement of forests by timber enterprises.
- Reforestation and agricultural-reforestation programs, soil recovery, protection of basins, production of fire wood and vegetal carbon are declared to be in the public interest.

The competent authority established by special law is mentioned, although not defined, and is put in charge of several activities related to forestry. Those functions are outlined by the CDF.

3.1.7 Protected Natural Areas

Regulations establishing protected natural areas date from the '30s and are very complete. They can generally be divided into two groups: one dealing with provisions that regulate the general aspects of all the protected natural areas, and the other dealing with specific provisions for specific protected areas.

The compilation that was carried out includes both types of regulations. The chapter dealing with specific protected areas includes specific provisions for each protected area. The general provisions that are included in the first group of rules are the following: S.D. 22884 dated August 3, 1991; S.D. 22763 dated March 28, 1991; S.D. 12301 dated March 14, 1975; S.D. 11686 dated August 13, 1974; S.D. 9328 dated July 23, 1970; S.D. 8063 dated August 16, 1967; S.D. 7443 dated December 22, 1965 (abrogated), and S.D. without number dated August 2, 1939.

The Natural Environmental Law, the Regulation of Ecological Pause and other legal rules establish the following characteristics for protected areas:

- Natural and Cultural Patrimony of the State.
- Coexistence with traditional communities.
- Of public and social interest.
- Intangible, inalienable and imprescriptible.
- Restrictive of the property.
- Organized into a national system to advance conservation efforts.

The same legal provision states that the categories of protected areas will be established by special legislation. Legal provisions prior to this law determine the existence of the following categories:

- National Parks
- Biological Reservations
- Biosphere Reservations
- Forestry Reservations
- Natural Renewable Resources Reservations

- Wildlife Sanctuaries
- Wildlife Shelters
- Shelters and Sanctuaries for the Conservation of Wild Fauna
- Regional Parks
- Equivalent Reservations (mentioned by the General Forest Law, the Wildlife Law, etc.)

The general objectives of the protected areas are as follows:

- Protection and conservation of wild flora and fauna, genetic resources, natural ecosystems, hydrographic basins, and scientific, aesthetic, historic, economic and social interests.
- Conservation and preservation of the natural and cultural patrimony of the nation.
- Development of experimental programs or definitive programs for the management of the preservation and protection of wild animals.
- Promotion of reproduction of necessary species.
- Protection, conservation and propagation of wild animals, especially of those species both resident or migratory that are considered to be in danger of extinction.

Competence for the creation of protected areas is set forth in the Wildlife Law; however, some of the concepts contained in it are not applicable to the new structure of the Executive Power determined by the Law of Ministries. Thus, while no new competencies are clearly established through one law, their creation shall be subject to the Executive Power as a whole through supreme decrees.

According to the Natural Environment Law, the management of protected areas shall be carried out according to their categories, zoning and rulings, based on management plans and scientific research aimed at protecting and conserving natural resources, with the possible participation of public, social or private enterprises without economic reward, as well as settled traditional communities and indigenous communities.

The control and surveillance of the natural protected areas is regulated by the following:

- ① S.D. 14459 dated March 25, 1977, which states that the duties of the Forest Keepers are the surveillance and technical control of Parks and National Reservations.

- ② S.D. 12301 dated March 14, 1975, which states that the CDF shall be in charge of the conservation and protection of Wildlife Shelters and Sanctuaries.
- ③ S.D. 9013 dated November 27, 1973, which sets forth as functions of the Forest Keepers of the Nation, the protection, surveillance and conservation of natural renewable resources.
- ④ S.D. 10702 dated January 25, 1973, which grants the Bolivian Institute of Tourism the power to participate in the protection and conservation of National Parks.

3.1.8 Water and Hydro Resources

On November 28, 1906, the Law of Dominion and Utilization of Water was approved. This law was abrogated by later provisions or, in several cases, its provisions fell out of use or became inapplicable because of changes in the actual structure of the State; however, many of its precepts are still valid. An example is the principle that water should not be used in a manner that hinders use by third parties.

The Mining Code, which was approved in 1992, establishes for a specific case, the obligation to restore water to its original state before use.

The Natural Environmental Law consistent with the Political Constitution of the State indicates that water in all its states is originally the patrimony of the State, and that its utilization and management shall consider the following:

- Its protection and conservation as a principal task, considering that it is a basic natural resource necessary for all vital processes; its utilization is related and influences (impacts) all sectors related to development.
- Planning, protection and conservation of water and the integral management and control of basins, as priority duties of the State.
- Planning and promotion of its use and integral utilization, for the purpose of ensuring its permanent availability.
- Priority of actions to ensure drinking water for the whole population.
- Discharge control which can cause water pollution or degradation of its surroundings.

On the one hand, fishing resources are regulated by several legal provisions, among them the Wildlife Law, the General Forestry Law, the Regulation of Fishing and Agriculture of

1990, in which the competent authorities are established, and exploitation of fishing resources, licenses, allowable fishing methods, etc., are regulated. In this respect, the Natural Environmental Law, in the corresponding chapter, sets forth that the State shall develop the sustained use of the hydro-biological resources applying adequate management techniques that will prevent the loss and degradation of the same. In the same way, it establishes that the extraction, capture, and cultivation of species will be carried out through fishing activities regulated by special legislation.

Besides the above-mentioned laws, there are legal provisions regarding water that refer to the creation of institutions responsible for the management and distribution of drinking water, as well as specific provisions dealing with certain basins or rivers, which total about one hundred. It is also important to mention that the norms that regulate the forestry resources mainly refer to aspects related with the conservation of basins, as well as the subscription of international treaties such as the Amazon Cooperation Treaty, approved and ratified by Bolivia through Decree Law D.L. 16811 dated July 19, 1979.

Notwithstanding the above-mentioned, it can be concluded that legislation on water at present is composed of rules which are not up to date, which are incomplete and disorganized, and which do not match current realities and national needs. Therefore it is necessary to approve new legal provisions that adhere to the principles established by the Natural Environmental Law.

In this sense, at present a draft regulation of the Natural Environmental Law is under preparation dealing with the pollution of hydro resources, which establishes the obligation to discharge water according to the quality and type of the receptive bodies. For this reason, the receptive bodies of water are being classified, parameters are being established, and research and necessary analysis are being undertaken to control water quality and regulate the discharge of polluted water.

Also under preparation is a draft of the Water Law Project, which will deal with the public dominion of water resources; unity of promotion; integral treatment; economy in the use of water; concentration and decentralization; efficiency in the participation of users in relation to the unity of the hydrographic basin, consistent with the public promotion of the water in the territorial order; sustained utilization guaranteeing the right of use of this resource to future generations, equal distribution and minimization of costs. The project

will also list the instruments needed to achieve the application of its principles, and preferential categorization in the utilization of this natural resource giving preference to the provision of drinking water and sewage.

3.1.9 Air and Atmosphere

There are not many provisions regulating the rational use of air. The Natural Environmental Law sets forth some general principles regarding this resource:

- It is a duty of the State and of society to maintain the atmosphere in a condition which will sustain life and its development in the best and healthiest conditions.
- Monitoring of air pollution which could damage health or the natural environment, or cause problems to the community and its inhabitants, as well as toxic effects on private and public property.
- Smoking in schools and health centers is considered premeditated willful damage, and smoking in closed places is prohibited.

Bolivia approved and ratified the Agreement related to the Ozone Cover and the Climatic Changes. At present, Quality of Air regulations are being prepared to make the principles governing this resource consistent with the Natural Environmental Law. Some parameters related to air quality are also included.

3.1.10 Soil and Land

The Natural Environmental Law dedicates one chapter to soil resources where the following aspects are set forth:

- Soil shall be used in a way that respects soil quality.
- Promotion of territorial order in order to harmonize the use of land and achieve a sustained development.

Over the last fifty years, the utilization of the soil has been the main objective of the legislation. In this sense, during the '50s some measures to promote soil conservation were adopted, with the approval of the S.D. 3612 which created the Forestry Direction of Hunting and Soil Conservation (abrogated). This entity was responsible for the

conservation, development, exploitation, industrialization, and economic utilization of renewable economic resources.

One important aspect related to the soil conservation is the matter of land ownership. With respect to this matter, the Agricultural Reform Law of 1953 established how agricultural properties could be acquired and maintained through work, a concept that has been set forth in the actual Political Constitution of the State.

The Council of Agricultural Reform became the organization in charge of granting titles to agricultural property. However, it was discontinued in 1992 due to several deficiencies in its operation.

As a consequence, two commissions were created: the first one gathered several institutions related to the issue, which did not comply with the expected objectives, due to a lack of adequate mechanisms to regulate its operation and due to a lack of flexible criteria among the institutions that were part of it; for this reason the commission ceased to operate right at the start, without having had the opportunity to provide the expected results.

Later on, the Government took over the Commission of Intervention through MACA, which was in charge of nominating its head and establishing the Commission team. This Commission could not comply with the established objectives and goals thus, its operation was canceled, and it was decided to create a new institution which would take deal with land problems. For this, a Law Project was prepared for the creation of INTI (National Institute of Lands), and at the same time the CSUCB presented another project. At present, a commonly agreed upon project is being sought, which shall be approved by the Legislative Power with the objective of modernizing and actualizing legal provisions that will contribute in an efficient way to clarifying the issue of land and its derivations.

The regulation of the Ecological Pause establishes in its third chapter some provisions regarding the order of land use, granting to the Regional Development Corporation and to the Department Directions of the CDF the responsibility for preparing an optimum map indicating most adequate use of land, prior to conducting a feasibility study, using a methodology that can be applied on a national level. In order to achieve this, MACA and SGMA have been put in charge of establishing an order of land use.

3.1.11 Colonization

The Colonization Law 7765 dated July 31, 1966, was approved for the purpose of populating uncultivated and unused zones in order to rationally exploit them, seeking such development to promote economic, social and sovereign benefits for the nation. The Bolivian Institute of Colonization is responsible for making the relevant plans. Two types of colonization are recognized: oriented or planned colonization, and spontaneous colonization. Colonization through private initiative is also possible, assuming compliance with certain requirements. People over the age of 18 can become colonists following a personal guarantee and compliance with a contract. With reference to the distribution of land the Family Economic Unit was established, an entity to satisfy the working needs of colonists. The adjudgement of land for colonization takes place in two steps: the first one is temporary and lasts two years; the second one takes place later, after compliance with the first step and certain requirements is ensured. In the end, a definite title of property is granted. The transfer of colonization properties is done by succession, grants, and compliance with obligations, with the approval of the Institute. The law is in charge of the conservation of the natural resources and the natural environment in general in colonization zones.

Legislation regarding Agricultural Reform and Colonization, as well as legislation related to other specific property regimes and the use of soil resources have been passed in an isolated manner without taking into account other regulations and restrictions. Moreover, the capacity or natural fitness of resources, and aspects that will raise a conflict of interests which will have a negative impact on the rational and sustained utilization of the resource, have not been taken into account. For this reason, it is important to approve territorial order instruments which will provide a solid basis for the equal distribution and rational use of soil and land resources.

3.1.12 Ethnic Groups

Regulations regarding ethnic groups are closely related to environmental regulations. In this sense, the Natural Environmental Law in the chapter referring to population sets forth that the State shall create mechanisms and procedures to guarantee the participation of traditional communities and indigenous communities in the process of a sustained development and rational use of natural renewable resources, considering the social,

economic and cultural aspects in the environment where such activities are pursued. The rescue and utilization of knowledge regarding the use and management of natural resources with the direct participation of traditional and indigenous communities has already been implemented. The chapter related to Natural Protected Areas states that the declaration of protected areas is consistent with the existence of traditional and indigenous communities, considering the objectives of conservation and related management plans. The chapter related to wild flora and fauna establishes that the State shall promote development programs in favor of communities which traditionally utilize the wild flora and fauna resources for survival. In this way, plundering will be avoided, and sustained utilization will be achieved.

The Forest Law states that it is the responsibility of the CDF to protect the country's jungle tribes, to set limits on the national territory appropriate for their survival, to guarantee and protect their hunting and fishing resources, and to incorporate such tribes in forest-related jobs, for example, as forest keepers or rangers.

Between 1990 and 1992, and as a result of the "Indigenous Communities March", several S.D. were approved declaring certain zones as indigenous territories or areas. At the same time, the Bolivian Indigenous Institute was created as a decentralized organ of MACA; a commission in charge of preparing the draft for the Law of East and Amazon Indigenous Communities was established; a decree eliminating rural taxation of communities of native origin, ex-ayllus farms, indigenous people, ethnic groups and jungle tribes was approved; and the execution of a program for bilingual intercultural education in all the aymara, quechua and guarani communities was implemented. The Declaration of the Indigenous Communities, however, had several gaps regarding the legal nature of its established declarations, and it did not have sufficient legal support.

Later on, through the reform of the Political Constitution, the State recognized its duty to protect the social, economic and cultural rights of indigenous communities, especially those rights related to common lands, guaranteeing the use and sustained utilization of natural resources. The State also recognized the legal personality of indigenous and peasant communities and associations and peasant unions.

Although the Constitution recognizes the right to common land, it is not clear what the legal nature of the same is with relation to third parties who have rights over the same zones. This legal problem must be resolved by a Law of the Republic.

Bolivia ratified Agreement 169 of the Indigenous and Tribe Communities in Independent Countries (Meeting of the OIT dated June 27, 1989) and the Constitutive Agreement of the Fund for the Development of the Indigenous Communities in Latin America and the Caribbean (Madrid, July 24, 1993.)

3.1.13 Evaluation of Natural Environmental Impacts (EIA)

The concept of Natural Environmental Impacts in Bolivian Legislation appears as a part of the instrumentation of the principle of prevention established by the Natural Environmental Law, which defines it as a set of management procedures, studies or researches and technical systems that allow an evaluation of the effects that the execution of a certain work, activity or project could cause to the Natural Environment. The evaluation has its starting point with the compulsory categorization of works and projects according to four levels:

- Those that require an integral EIA.
- Those that require an analytic specific EIA.
- Those that require a conceptual review.
- Those that do not require an EIA.

If the work, project or activity corresponds to one of the first three categories, a Study of Evaluation of the Natural Environmental Impact (EEIA) shall be conducted and shall be processed by the related sectorial organisms and reviewed by the environmental authority. If it is approved, the relevant authority will issue the Declaration of Natural Environmental Impact (DIA), an instrument which serves as a legal and technical reference for periodic evaluations of the execution of such works, projects or activities.

The procedure rules for presentation, categorization, assessment, approval or rejection, control, follow up and monitoring of the Studies of Evaluation of the Natural Environmental Impact shall be set forth by specific regulations.

In May 1994, the Ministry of Sustained Development approved a provisional Rule for the Evaluation of the Natural Environmental Impact which introduces the Environmental Card (FA) as an instrument of EIA categorization. The supreme decree which regulates the Law of Ministries requests that the National Secretariat of Natural Resources and Environmental Issue operate of the System of Assessment of Natural Environmental Impact for projects of investment, as well as mechanisms related to the control and surveillance of same.

At present, other projects are being prepared. These include the Project for Ruling of the Prevention and Control of the Environmental Quality, which outlines the procedures for the EIA, as well as the control mechanisms of activities, works and projects that are being carried out. The project for ruling maintains the mechanism of categorization established in the provisional ruling of the EIA, and clearly establishes its institutional framework.

3.1.14 Ruins and Culture

The protection of ruins and culture are designated by the Article 191 of the Constitution. The contents of this Article 191 is as follows:

TITLE IV : CULTURAL REGULATIONS	
Article 191	The monuments and archaeological objects are property of the State. The colonial artistic richness, the archaeological richness, as well as the historical and documentary resources and the origin of the religious cult are a cultural treasure of the Nation, are under protection of the State and cannot be exported. The State will organize and carry out the registration of all the archaeological richness and the historical, documentary and religious resources, providing its custody and taking care of its conservation. The State will protect buildings and objects that are declared with artistic or historical value.

3.1.15 Conclusions

- ① Bolivian Environmental Legislation is consists of several provisions which regulate the utilization and management of natural resources.
- ② The Natural Environmental Law systematizes and organizes the utilization of the integral parts of the environment introducing the concept of its integral management within the concept of sustained development.

- ③ The application of the provisions set forth in the Natural Environmental Law must be supplemented by the regulation of the environmental aspects of specific regimes,
- ④ In the same way, a ruling which establishes the procedures to make its application efficient is required.
- ⑤ There are still deficiencies and legal conflicts in the regulation of natural resource utilization, as in the specific case of the use of soil and land, whose resolution is to be found outside environmental regulations. Therefore, it is necessary to introduce a process of environmental principles in the present national legislation.
- ⑥ Although legislation contemplates some rules for the use of land related to the conservation of nature, these are not consistent with the different legal entities and the first priority for the use of land is not defined.
- ⑦ It is necessary to clearly define the extension of the original common lands in relation to their inhabitants and third parties.
- ⑧ Legislation on water is broad and in some cases not applicable given the present structure of the State. Such legislation does not respond to the principles established for the conservation of the natural environment, thus it is necessary to approve a new Law of Water.
- ⑨ The issue of the water resources is divided into sectors, a fact which does not allow the application of a true national policy for its conservation. It is therefore necessary to have a national authority of waters that can define the strategic policies and coordinate among the other institutions (SNRU National Secretariat of Urban Resources, SNA National Secretariat of Agriculture, SNM National Secretariat of Mining.)

3.2 Organization

3.2.1 Brief Historic Description of Policies and Environmental Management

Resolution of environmental questions, especially at the governmental level, is a phenomenon of the last ten (10) years. This phenomenon is characterized by the quick growth of institutions and the search for common objectives.

On the government's side, it first appeared as the Undersecretariat of Natural Resources within the Ministry of Agriculture (December, 1988.) Later on, this Undersecretariat became an independent Secretary of the Presidency (January, 1990.) SENMA was created after the Environment Law, Law No. 1333, was promulgated (April, 1992.) At the same time, other institutions appeared, such as FONAMA (National Fund for the Environment, 1990), environmental departments in municipalities, ministries and, even in the parliamentary commissions of the Senate and the Chamber of Representatives.

In the private sector, the institutional network has been consolidated through LIDEMA and Environmental Forums. Several NGOs (non-government organizations), in particular common or civic initiatives, have emerged and other existing institutions have begun to pay more attention to this matter.

In the public sector, the Ministry of Sustainable Development and Environment is responsible for the formulation of environmental policies. Its work is complimented by the laws of the National Congress and, obviously, by the actions of NGOs and other manifestations of the Civil Organized Society.

Some secretaries, such as the Health Secretariat, have established small departments oriented toward work on matters related to their actions. Also, some Municipalities have established units of environmental sanitation that inspect public places. However, these have been isolated actions, directed only towards specific sectors and with minimal impact.

Another public institution of some importance is the Center of Forestry Development, created in 1974 as an entity responsible for the supervision of wildlife and the national utilization of forests. Because of legal and financing problems, this institution has not

fulfilled its commission of protecting forests and wildlife, at least in a general way. It therefore urgently requires reorganization and modernization.

In 1990 the National Fund for the Environment (FONAMA) was created as a financing entity in charge of facilitating the environmental policies of the public and private sectors. This Fund has grown quickly, obtaining large resources and canalizing money toward environmental projects. Its actual portfolio is about US\$10 million for performance, US\$60 million that has already been compromised, and US\$20 million for management.

This entity has been seeking social participation, the agreement of all parties, planning from bottom to top, and permanent counseling for the formulation of environmental policies. Its basic instrument for this purpose is the Planning Secretariat of the Ministry of Sustainable Development and Environment, which uses as one of its mechanisms the Project of Capacity 21, which organizes counseling meetings at a regional and national level.

The accelerated growth and proliferation of environmental institutions indicates the attention this matter is receiving. Years ago, environmental matters were treated only in some places and the Bolivian Government did not give any importance to it. This situation has changed, and this matter is now on the agenda of the national Government, departmental governments, and general citizenry of different regions around the country. It is also true, however, that much has been said about this matter, but few concrete actions have been taken. So far, most environmental indicators have not improved, and in some cases, negative trends continue.

However, due to the investment of resources and the attention being given to this matter, the base for a more effective action is certainly being created. No study has yet been conducted to determine the amount of money that is being invested in this matter, but it can be estimated that the Government, international cooperate entities, CORDES, NGOs, and base organizations will assign US\$20 million to US\$30 million annually to finance environmental activities.

Regarding the coordination of and relation among the public institutions working on the formulation of policies, the Council of National Development (CONADE) can be mentioned. Among the participants in this organization are the Ministry of Sustainable

Development and Environment, the Ministries of Human Development, Economic Development, Defense, Foreign Affairs and Treasury, and several National Secretariats. In this instance, economic and social policies as well as policies regarding the sustainable development that are introduced in decrees, supreme resolutions or resolutions by ministries are suggested, discussed, and arranged.

3.2.2 Actual Policies of the Government regarding Sustainable Development and the Environment

Of the policies that have been introduced, perhaps the most important ones have been the following: the declaration of an Ecological Pause in 1990, the promulgation of the Environment Law in 1992, the formulation and performance of the Plan for Environmental Action in Bolivia in 1993, the creation of the Ministry of Sustainable Development and Environment in 1993, and the elaboration of the General Plan for the Economic and Social Development: A Change for Everyone (1994.)

One of the most important historic targets for environmental management in Bolivia has been the promulgation of Environment Law No. 1333, which provides instruments to implement concepts for Sustainable Development, and which creates the legal framework for the regulation of human activities related to environmental issues. However, this law has a general character and it will prove effective only if regulations (environmental management, prevention, control, air pollution, hydro pollution, and activities involving dangerous substances) are created. The establishment of these regulations has already been concluded, but they have not yet been approved by a Supreme Decree.

The Government has especially emphasized environmental management in order to reverse the trend of the unsustainable handling of natural resources. This started with Executive reform through the creation of high level environmental management instruments, such as the Ministry of Sustainable Development and Environment, which is responsible for the country's long-term social and economic planning.

The actual policy of the Government emphasizes the four pillars of economic growth, social equity, reasonable use of natural resources, and management (refer to Figure 3-2-1.) To carry out its policies, the Government created the Ministry of Economic Development and Capitalization with Secretaries that take care of the productive matters, the Ministry of Human Development, which is in charge of implementing social welfare programs, and the

Ministry of Sustainable Development and Environment. The Ministries of the Government and the Presidency are in charge of managing policies.

The main measures on which the Government has placed priority to achieve sustainable development are: macroeconomic stability, the creation of transparent markets, the country's participation in international markets, popular capitalization, territorial order, land policy, administrative decentralization, State reforms, and a strategy of sustainable development. All these measures are part of the General Plan for Economic and Social Development: A Change for Everyone. The schematic synthesis of this Plan is shown in Figure 3-2-2.

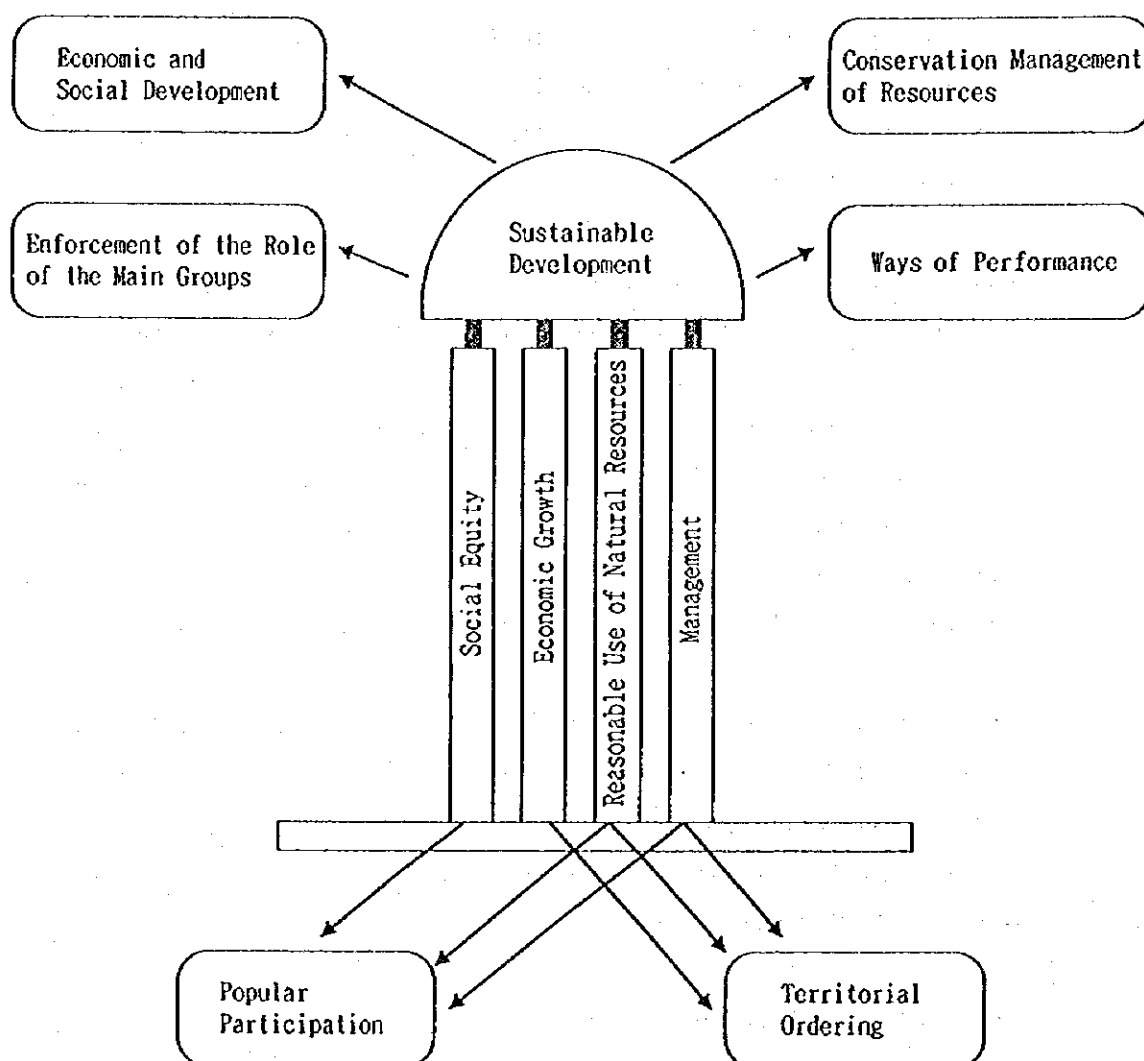


Figure 3-2-1 Pillars and Instruments of the Sustainable Development Policy

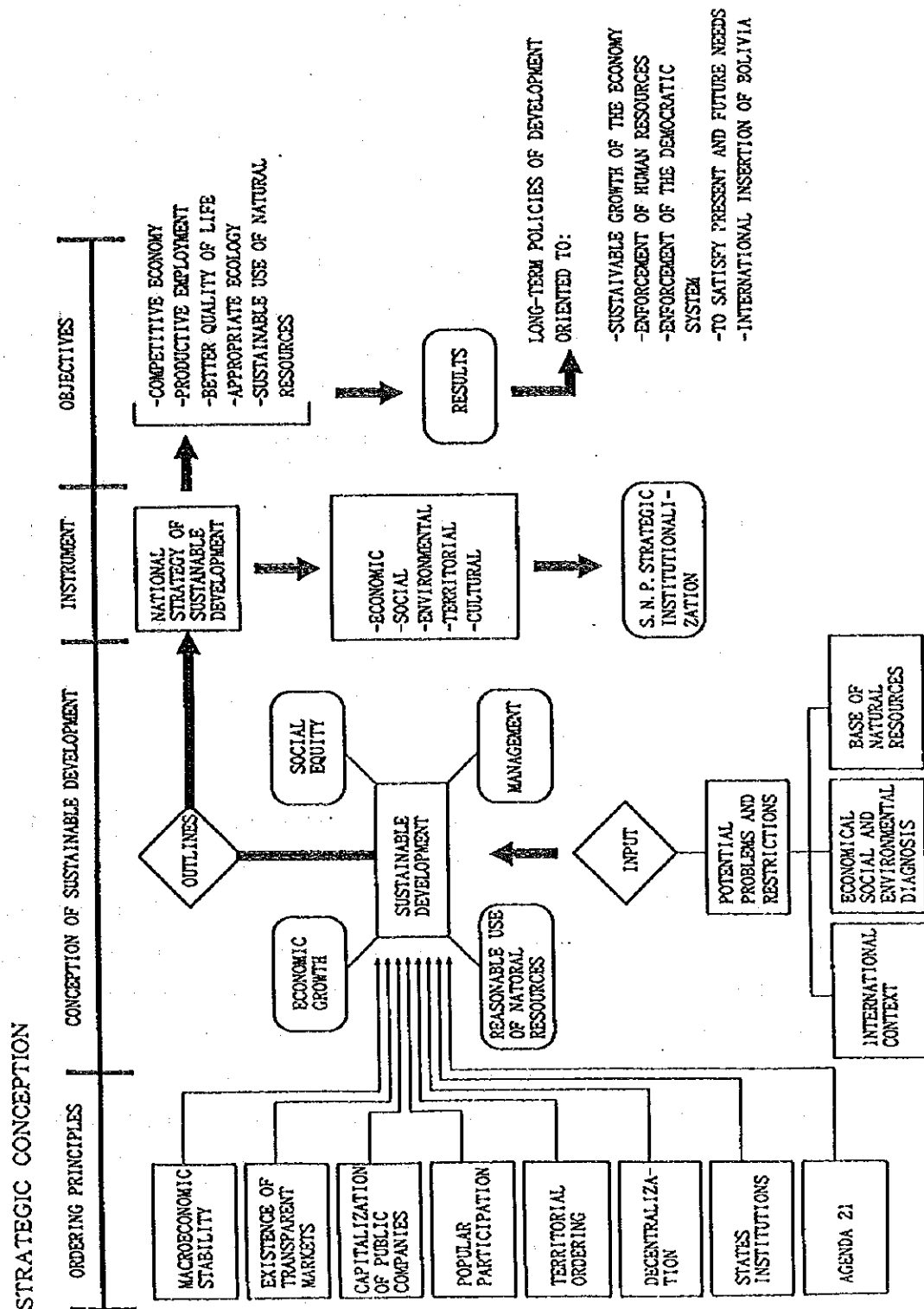


Figure 3-2-2 Strategic Concept of the Government's Policy

Specifically, regarding their environmental aspects, policies are directed towards making production compatible with conservation, to generate appropriate technologies, to regulate and apply environmental norms within permissible standards, to suggest the ways of handling natural resources without affecting the reproductive capacity of the ecosystem, in other words, to look for a balance between the use of natural resources and its support capacity without diminishing its vital functions.

Other important elements of the natural resources policy are territorial order, the use of space planning, the handling and conservation of soil, the preservation of biological diversity through the establishment of protected areas, banks of germ plasma, the promotion of wild flora and fauna investigations, control of hunting and fishing, rescue of native acknowledgment, and the sustainable handling of forests.

Regarding territorial order, the government is trying to establish zoning laws, according to the capacity of use of different ecosystems, assigning areas for agricultural activities, forestry, urban uses, protected areas, livestock, etc. This ordering is reflected in a national plan regulating the use of physical space with development suggestions emphasizing the integral handling of the hydrographical watersheds (basins), regional integration and the urban and rural population occupancy.

The land policy is directed towards creating a free market for land, in order to let embargo of rural property, to assure the access of peasants and native towns to the land, to try to reverse trends in the processes of small and large land estates with human settlement programs, rural credit, the establishment of norms for land transactions, concentration of small units through incentives establishing maximum extensions and a strict regimen for unused land. This policy is also directed towards guaranteeing the acquisition of land through clear and transparent transactions with the corresponding techniques of the agrarian organization of the sector. Finally, the project of the new law also takes into account means of guaranteeing that soil resources are sustained.

The project of law has been elaborated and discussed in different forums; however, promulgation has not been prompt.

Management policies and strategies are focusing on establishing procedures that will prevent or diminish environmental risks, permit the proper evaluation of environmental

impacts, monitor and control factories, industries and projects, and audit the effects of development activities on the environment.

Basically, the goal is to establish a system with two bodies. One body would deal with the prevention, regulation and implementation of procedures and environmental norms; and the other body would be in charge of controlling the environmental quality to ensure that established standards are not exceeded.

3.2.3 Active Government Institutions: Institutional Framework of Environmental Matters

Almost all the Ministries are involved in some way with environmental matters, especially those that participate in the Council for National Development CONADE. In this section, we will mention only those that are directly involved with environmental management. In this case, three (3) main ministries will be mentioned: the Ministry of Sustainable Development and Environment, the Ministry of Economical Development, and the Ministry of Human Development. The Ministry of Sustainable Development and Environment is described herein in detail. Of the other two ministries, only the secretariats that are directly involved with environmental matters are mentioned. Figure 3-2-3 shows the Ministries and Secretariats that are analyzed in this Section.

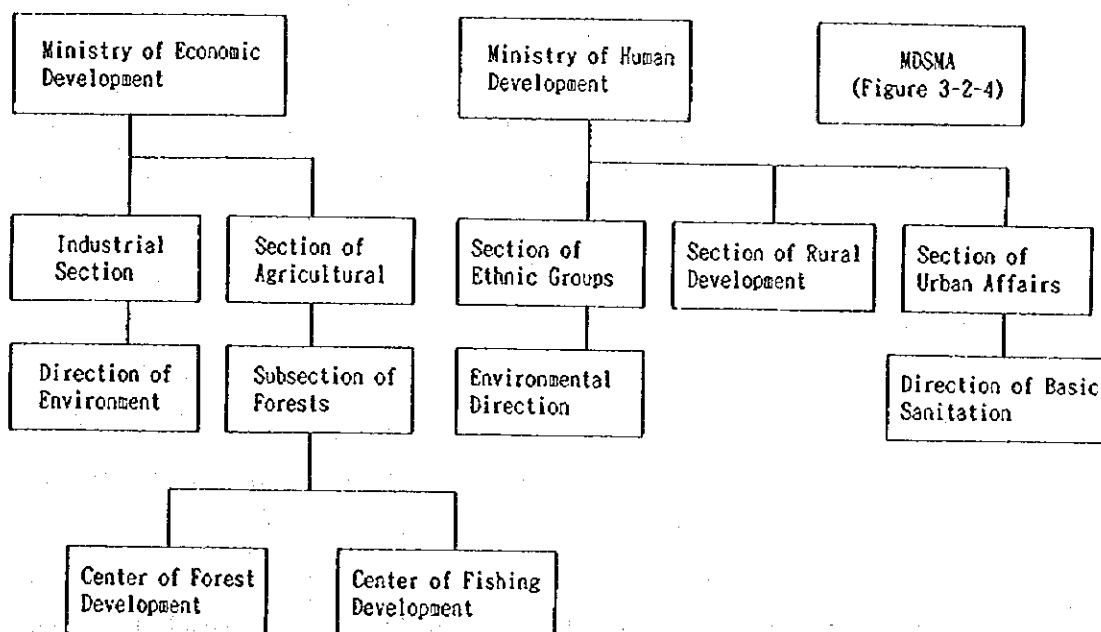


Figure 3-2-3 Division of the Development Ministries Involved with Environmental Matters

The most active organization involved with environmental matters, from the point of view of Executive Power, is the Ministry of Sustainable Development and Environment, which is responsible for the formulation of policies that will ensure sustainable development.

According to its norms, this entity has a permanent and formal participation in all environmental matters (Law of Ministries of the Executive No. 1493 of September 17, 1993.)

(1) Ministry of Sustainable Development and Environment

The Ministry of Sustainable Development and Environment is the highest environmental authority of the Executive regarding the formulation of laws and policies, and the application thereof. This means that this entity is in charge of the norms and fiscal matters regarding the use of natural resources and environment, in coordination with sectorial ministries and according to general policies.

Its main objective is to contribute to sustainable development through economic and social policies and the application of norms that regulate the rational use of natural resources or their protection.

This ministry is related to other State organizations as follows:

- Council for National Development CONADE. Since the Minister participates in the National Council for Development, he has time to suggest general policies, coordinate actions, and promote other ministries to implement a conservative attitude.
- The relations between two ministries, through agreements or coordination of the application of corresponding norms.
- The Departmental Councils of Sustainable Development, where different public, private, working, and academic institutions participate. The advantage of this departmental level is that actions can be agreed upon by coordinating resources and optimizing capacities (this is included in the Law No. 1333, but has not been established yet.)
- Institutional Design. Since the Ministry of Sustainable Development and Environment is responsible for environmental matters, its structure will be analyzed in detail. Its internal organization consists of three (3) National Secretariats which are: Secretary of Planning,

Secretary of Natural Resources, and Secretary of Environment. It also includes the participation of all the citizenry.

a) National Secretary of Planning

It is responsible for elaborating a strategy of sustainable development, institutionalizing the planning system, designing a program for pre-investment, and acquiring funds for pre-investment in the strategy of sustainable development. To carry out these functions it has three (3) undersecretariats, which are: Undersecretariat of Pre-investment and Projects, Undersecretariat of Territorial Order and Undersecretariat of Development.

The auditing commission of Agrarian Reform and Settlement depends on this Secretary. This commission was formed by fusing together two branches: the old National Council for Agrarian Reform and the Institute of Settlement, which due to their technical and administrative inefficiencies, were placed under the Government's control and were united under only one Direction. This measure initially a temporary one, but it has been in effect for more than three (3) years, and the structure of the direction has not been specifically defined because they are waiting for the Land Law to establish an institutional framework for the administration of the nation's land. At a departmental level, this commission takes care of the Regional Offices that were previously part of those institutes.

b) Secretary of Natural Resources and Environment

The basic function of this Secretary is to suggest and establish an environmental legal framework, to implement a system of the environmental impact evaluation and environmental control, to formulate policies that will ensure the sustainable use of natural resources and watershed handling, to suggest a system of incentives and sanctions, to provide the environmental education, and to ensure citizenship participation in environmental management and environmental communication.

The Secretary of Natural Resources and Environment has three (3) undersecretariats: First, the Undersecretariat of Environmental Quality, which is in charge of environmental control, impact, and the establishment of quality standards. Annex No. 1 details the activities of this undersecretariat, and shows the procedures used of control and evaluate environmental impact.

Second, the Undersecretariat of Natural Resources, which deals with watershed (basin) handling, the preservation of biologic diversity, protected areas, and the conservation of soil and forests.

Third, the Undersecretariat of Environmental Promotion, which is in charge of education about sustainable development, social participation in environmental management, agreements among institutions, and communication of sustainable development. The system of environmental information is also handled by this undersecretariat.

c) Secretary of Popular Participation

This entity is responsible for implementing the Law of Popular Participation (No. 1551), as well as for directing the process of its implementation. A better distribution of public income and a better distribution of resources to municipalities (310 in all the country) are the aim of this Law. The delimitation of municipalities and the reorganization of the attributes of public entities are also sought with this Law. One important aspect is the recognition of Base Territorial Organizations OTBs, which are constituted by different organized communities and native people, depending on their use and ancient traditions. This recognition implies a better integration of native communities into the legal, economic and social life of the country. The municipalities must satisfy the demands of the OTBs that are under their jurisdiction. Each municipal corporation has a vigilance committee formed by representatives of the OTBs. This committee looks after the use of municipal resources.

The Secretary of Popular Participation has two (2) undersecretariats, which are the Undersecretariat of Municipal Assistance and the Undersecretariat of OTBs Assistance.

(2) Ministry of Economic Development

Several secretaries related with the productive sectors of environmental management are organized under this ministry, including the Secretary of Industries, Secretary of Transportation, Secretary of Mining, and the Secretary of Agriculture. Environmental matters are handled by these secretaries.

a) Secretary of Agriculture

The Undersecretariat of Forestry Development, Recollection and Fishing is under this Secretary, and it is in charge of both the Center for Forestry Development (CDF) and the Center for Fishing Development.

The Center for Forestry Development is particularly important because it is the organization in charge of fiscalization of the use of forestry resources. The CDF is spread throughout the country, especially in the areas influenced by the construction of the future road between San Borja and Trinidad. The CDF is not well respected because it is inefficient, and there have been accusations of corruption, especially regarding the problems of tax evasion and land rights.

b) Secretary of Transportation

This secretary does not have a direction related to the environmental impact of transport routes (aerial, terrestrial or maritime), but the National Department of Roads (SENAC) does provide a variety of counseling services to evaluate the environmental impact of different road projects, such as the Chimore-Yapacani or the Patacamaya-Tambo Quemado. These environmental impact studies are presented to the Direction of Environmental Impact of the Undersecretariat of Environment for their corresponding approval or consideration.

c) Secretary of Industries and Secretary of Mining

These are in the process of being fortified to manage environmental matters derived from their activities. Usually, the insufficient attention paid mining and industrial interests on environmental effects are discussed by the citizenry.

(3) Ministry of Human Development

This ministry is responsible for the formulation, provision of instruments and fiscalization of policies in the areas of health, social security, basic sanitation, education, urban affairs, rural development, natives, manners, and general affairs.

In this case, only the activities of the Secretary of Rural Development, Secretary of Natives, Manners, and General Affairs and the Secretary of Urban Affairs in the area of basic sanitation will be mentioned.

a) Secretary of Rural Development

This secretary must look to the decrease of rural poverty, assisting investments in productive infrastructure, such as irrigation, road access, and credit in the framework of environmental conservation. For this purpose, it has elaborated development plans for rural municipalities and, at present, it is negotiating resources for their implementation. The Fund for Peasant Development is controlled by this secretary.

b) Secretary of Natives, Manners and General Affairs

This secretary has three (3) undersecretariats. One of these undersecretariats is in charge of problems involving native communities, especially regarding the legal matters related to their territories and ancient rights, with aspects such as peasant training, and social investment to satisfy the basic needs of these people. One Direction of this undersecretariat deals specifically with relations among native communities and their surrounding environment, with matters regarding the formulation of policies and assistance to native initiatives in environmental projects, and the handling of natural resources.

c) National Secretary of Urban Affairs

The Direction of Basic Sanitation (DINASBA) is under this secretary, and its objective is to facilitate the implementation of policies, plans and programs for potable water, sewerage, disposition of domestic sewage, and the handling of residues. With its programs, the government hopes to decrease problems of contamination that affect human health and environmental quality. DINASBA works together with the City Councils of the Municipal Corporations and the Regional Corporations of Development. The Fund for Regional Development finances larger cities, while the Fund for Social Investments finances rural areas.

3.2.4 Existing Institutions in the Provinces of Ballivian, Yacuma, Moxos and Cercado in the Beni Region

Of all the institutions existing at a national level, only a few are active in the zone influenced by the construction of the future road because most of them have a normative character, and most of the public offices are still concentrated in La Paz. For that reason, only those branches that have some impact or permanent presence in the zone will be mentioned in this Section.

Maybe the most important of all is the Regional Corporation for the Development of the Beni Region (CORDEBENI). The last Decree of the Organic Regulation of the Corporations (23845) established its public and decentralized character, making it dependent on the Ministry of Sustainable Development and Environment. Its basic functions are to elaborate and suggest departmental plans for development, integrating the micro-regional plans of the municipal corporations, negotiate resources for the investment of physical, social, environmental and road infrastructures, and provide administrative services to the municipalities.

The national institutions with a presence in these provinces are the CDF, the Secretary of Natives, the Forestry Project for the Forest of Chimanes, the Direction of the Conservation for the Biological Diversity, the Auditing Commission of Agrarian Reform and Settlement, and the Secretary of Popular Participation.

On a municipal level, in these four (4) provinces the following municipal corporations have city councils: Santa Ana, San Ignacio de Moxos, Rurenabaque, Trinidad, San Borja, and Reyes. Many of these native communities have also been granted legal status as OTBs, such as those from the Native Multiethnic Territory.

Of the most active non-governmental organizations that in some way are engaged in environmental activities in the zone, the following can be mentioned: Veterinarians without Borders (from France), who settled since 1989 in the zone of Rurenabaque; the Episcopal Commission of the Social Pastoral (CEPAS in Yucumo since 1988); the Central Committee Menonita (CCM, located in the settlement zone Yucumo-Rurenabaque since 1988); and the Center for Farming and Husbandry Services established since 1987 in the province of Ballivian, and recently also in Moxos. The children of the settlers created in 1990 the Center for Research and Technical Farming and Husbandry Assistance CEATA,

with enlargement activities. Most of all these institutions have implemented plans related to farming, forestry, communal forestry, environmental education, and the handling of natural resources.

The Biosphere Reservation or Biologic Station of the Beni Region is involved in education, and the investigation and conservation of protected areas, that exhibit a high biological diversity.

3.2.5 Multilateral Organizations Involved with Environmental Matters

In Bolivia there are several multilateral organizations that support environmental management, either with funds or with technical assistance. The following organizations can be mentioned: Organizations of the United Nations, such as the PNUMA; the GEF/PNUD (with various projects of institutional enforcement, planning, information network, etc.); FAO, dealing with soil, forests, and sustainable agricultural growth. The following institutions also have an active presence: the International Union for Conservation (UICN), which supports the preservation of biological diversity; International Conservation in protected areas; the World Bank with environmental projects; the Interamerican Bank of Development in zoning and institutional enforcement programs; the International Organization of Tropical Woods (ITTO), with projects involving the handling of forests, and the World Wildlife Fund supporting the initiatives of base organizations.

Most bilateral cooperation is also oriented toward environmental projects, and these include the involvement of countries such as Holland, Switzerland, Germany, the USA, Japan, and Canada.

3.2.6 Main Agreements and Treaties Relating to the Environment subscribed by Bolivia

Bolivia is signatory and actively participates in projects within the country or in deliberations of important environmental forums, such as the Amazon Cooperation Treaty, which has various training projects to preserve the Amazon Jungle; the Plata Basin Treaty for the handling of hydrographic watersheds; the International Convention regarding the commercialization of species in danger of extinction (CITES), which regulates the commercialization of wildlife; the Convention of the Conservation of Humid Soils

(Sitios-RAMSAR), which finances projects to preserve aquatic species; the Convention of Basilea regarding the International Traffic of Toxic Substances; the Protocol of Montreal aimed at the protection of the ozone layer, which has a project to reduce carbon emissions; the Rio Declaration, from which a project to elaborate Agenda 21 for Bolivia was implemented and the Convention regarding the Preservation of Biological Diversity. All these treaties have been dully signed and ratified in each country, where projects related and financed within this framework are being carried out. The Chancellorship of Bolivia is the office officially in charge of this matter, while the Ministry of Sustainable Development and Environment is the operative and technical entity in charge.

CHAPTER 4

OUTLINE OF THE ROAD IMPROVEMENT PROJECT

CHAPTER 4 OUTLINE OF THE ROAD IMPROVEMENT PROJECT

4.1 Objectives of the Project

The objectives of "The Study of the Road Improvement between San Borja and Trinidad" are the following:

- To examine the improvement of the road section between San Borja and Trinidad from technical and economic points of view.
- To conduct the necessary research and to work out a design for improvement of the road at the level of an all-weather road.
- To estimate and to analyze the social and economic impacts resulting from such improvement.

4.2 Proposed Design Standards

4.2.1 Basic Specifications of the Project

The basic specifications for improving the San Borja-Trinidad road section are summarized in Table 4-2-1.

Table 4-2-1 Basic Specifications

Item	Specifications
Road width	Total = 9 m Carriage 2 x 3.5 m = 7 m
Length of the Project	Road = 221.9 km Transfer = 7.1 km (Mamoré River) Total = 229.0 km
Main structures	17 bridges with a total length of 987.2 m (Seven of them are currently under construction and/or their construction was planned prior to the execution of the present Project.)
Ferryboat terminals	Two [2] (Mamoré River)
Channels	Three [3] (Mamoré River)
Type of pavement	Trinidad-Mamoré River: Asphalt concrete Mamoré River-San Borja: Asphalt concrete; however, a gravel surface will also be used between San Borja and the Mamoré River.

4.2.2 Design of the Project Road

The geometric design standards used for the project road were determined as shown in Table 4-2-2 based on the following norms:

- ① Road : Manual and Norms for the Geometric Design of Roads, 1984, SNC
- ② Pavement : AASHTO - Interim Guide
- ③ Bridges : AASHTO - Standard Specifications for Highway Bridges, ACI Code

Table 4-2-2 Geometric Design Standards

Item		Basic Value	Adopted Value
Topography		Plane	Plane
Design speed (km/h)		100	100
Minimum radius of horizontal curves (m)		415	425
Maximum grade %	Recommended	4	
	Admissible	5	3
Minimum visibility distance (m)	Braking	155	208
	Passing	425	
Superelevation (%)	Recommended	6	6
	Admissible	8	
Vertical Curves (K): Crest	Recommended	107	
	Admissible	58	58
Vertical Curves (K): Sag	Recommended	52	
	Admissible	36	50
Minimum vertical clearance (m)		5.5	≥5

Based on the above design, typical cross sections were determined for the Trinidad-Mamoré River and the Mamoré River-San Borja road sections as shown in Figure 4-2-1.

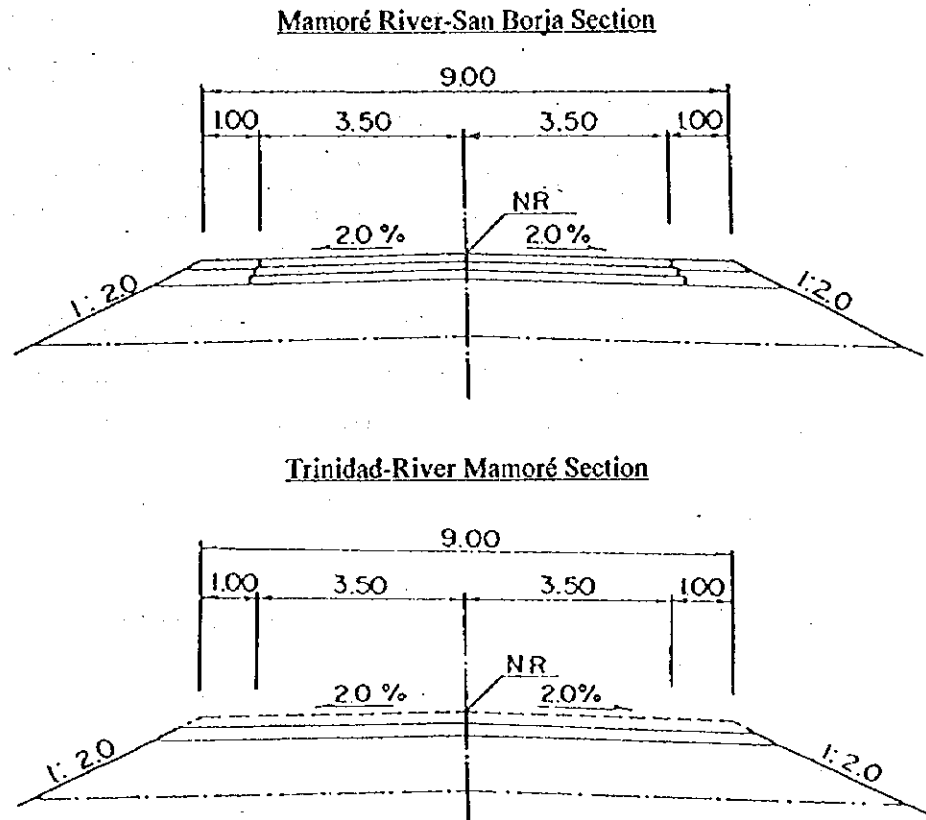


Figure 4-2-1 Typical Cross Section

4.2.3 Principles of Horizontal and Vertical Alignment Design

Horizontal and vertical alignment designs are based on the following principles:

(1) Horizontal Alignment

The maximum use of the present road was considered during selection of the route.

(2) Vertical Alignment Design

- ① In accordance with Geometric Design Standards.
- ② In areas prone to flooding, the elevation of the designed subbase course must be more than 60 cm above the maximum water level, which has an elevation of 154.80 m above sea level.
- ③ In areas not prone to flooding, the elevation of the designed subbase course must be 60 cm or more above the natural level of the present terrain. This criterion, however, does not apply to the road sectors with higher isolated elevations.
- ④ In road sectors close to bridges, the elevations proposed for the bridges will be adopted.
- ⑤ No excavation of the existing road shall be carried out. This criterion, however, does not apply where there are higher isolated elevations on the existing road.

4.2.4 Design of the Pavement

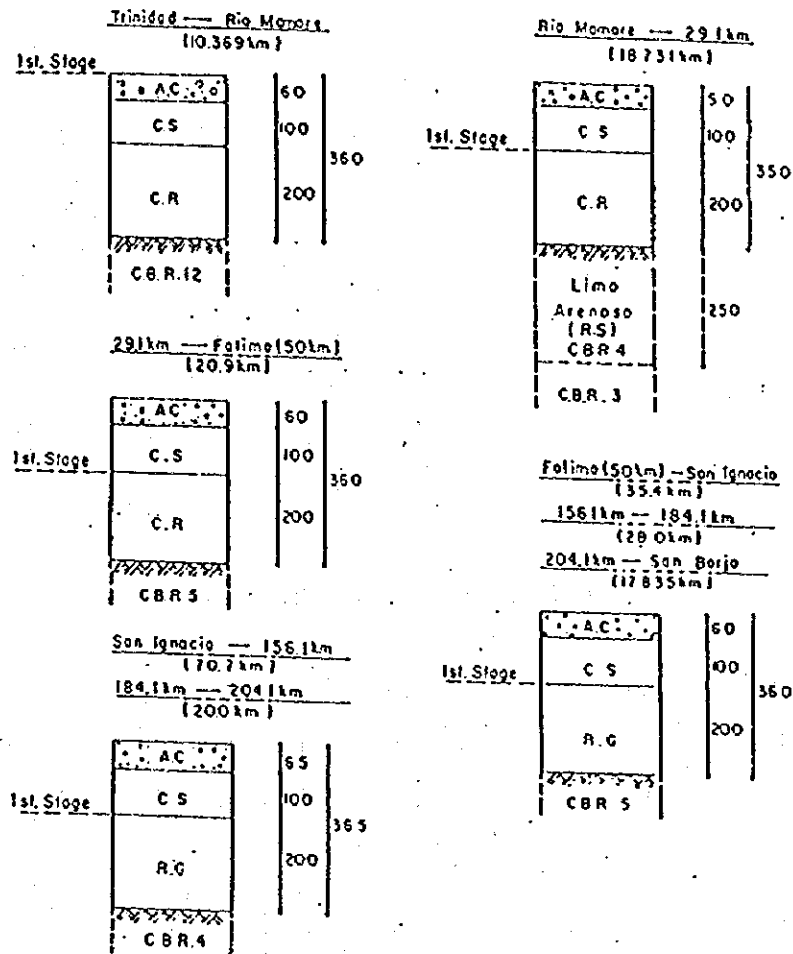
In designing of the pavement, five different types were adopted on the basis of road conditions as shown in Figure 4-2-2.

4.2.5 Design of Bridges

Rivers and streams intersect the present road in many places and pontoons are utilized to cross larger watercourses. Medium-sized and small river sections or places with insufficient drainage are provided with wooden bridges or corrugated pipes. The dimensions of the bridges and their typical cross sections are summarized in Table 4-2-3 and shown in Figure 4-2-3 in accordance with the following conditions:

- ① Type of Bridge: Prestressed concrete simple composite girders
- ② Abutment : Cellular abutments
- ③ Foundation : Reinforced concrete piles

A total of 349 corrugated pipes will be installed along the project road. The quantity and dimensions of their design are shown in Table 4-2-4 for each span or road section.



Note : The abbreviations used are defined below:

A.C. : Asphalt concrete (hot mix, from Cerro San Jorge)	Top layer
C.S. : Crushed stone (from San Jorge)	Base layer (CBR80)
C.R. : Crusher - run (from Cerro Chico)	Subbase layer (CBR60)
R.G. : River gravel (from the Caripo and Dartagnan River)	Subbase layer (CBR60)
R.S. : Sandy silt from the left margin of the Mamoré River	Improved subgrade

Figure 4-2-2 Pavement Structures

Table 4-2-3 Design of the Dimensions of Bridges

Name of the Bridge	Total Length	Length of the Girder	(Unit : m)
			Length of the Span
San Borja	25.660	25.660	25.000
San Gregorio	25.660	25.660	25.000
Puerto Almacén	25.660	25.660	25.000
Amistad	30.660	30.660	30.000
Sicuri	30.660	30.660	30.000
Tajibo	30.660	30.660	30.000
Mururita	30.660	30.660	30.000
Curirabita	20.660	20.660	20.000
Curiraba	25.660	25.660	25.000

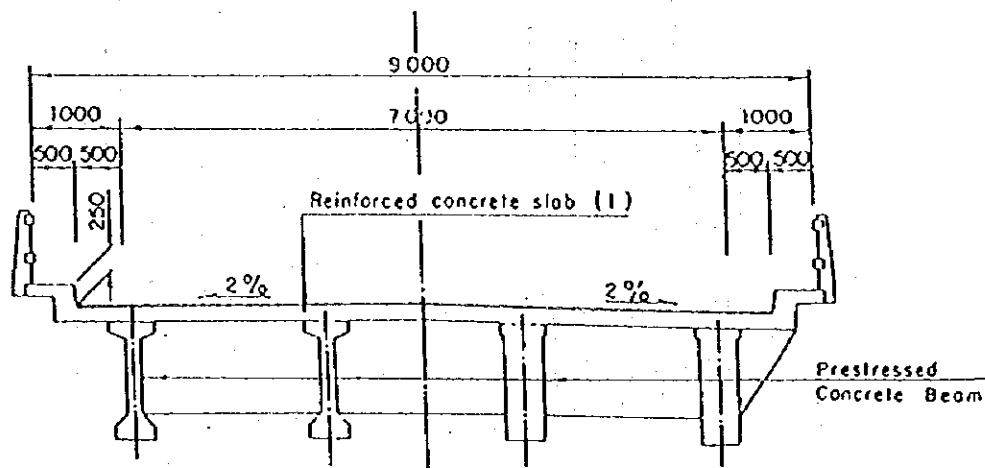


Figure 4-2-3 Typical Cross Section of Bridges

Table 4-2-4 Number of Corrugated Metal Pipes

Road Section	Diameter of the Corrugated Pipe								Total
	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	
I	-	-	-	-	-	-	-	-	-
II	-	-	2	-	-	-	7	10	19
III	1	6	1	1	2	5	2	14	32
IV	8	15	3	-	3	-	-	-	29
V	18	15	16	22	19	13	15	16	134
VI	19	4	2	4	-	-	-	-	29
VII	51	10	8	1	-	-	-	-	70
VIII	2	3	13	3	-	-	-	15	36
Total	99	53	45	31	24	18	24	55	349

4.3 Soil and Aggregates

4.3.1 Soil

Regarding soil classification, most of the material in the whole road section was classified as A-7, A-6 and A-4, although there was also a small amount of A-2. Each category makes up 45%, 29%, 23% and 3% of the total length of the road, respectively. All these materials can be used for filling the embankment and also as a subgrade material for the projected road, with the exception of the soils classified as A-7 in some parts of the road.

The soil (A-7) around the road between Trinidad and the right margin of the Mamoré River has a low CBR value ranging from 1 to 3, making it unsuitable as subgrade material. There is, however, high quality soil (A-4) in the last part of this section (in the natural embankment at the right margin of the Mamoré River), which can be used as subgrade material.

Most of the soil between the left margin of the Mamoré River and Km 19 has a low CBR value ranging from 1 to 3. Therefore, better quality soil should be used in the top part of the subgrade. As the top part of the subgrade, the high quality soil of the natural embankment at the left margin of the Mamoré River can be used.

4.3.2 Aggregates

The following quarries, gravel and sand pits, and aggregates will be used :

(1) Materials for the Subbase Course

- Borrow pits from the San Borja sector for the road between San Borja and station at Km 29.1:
Pit-run gravel from Caripo and Dartagnan.
Using a mix of materials obtained from both banks is recommended.
- Borrow pits from the Trinidad sector for the road between Trinidad and the station at Km 29.1:
Crusher run from Cerro Chico.

(2) Materials for the Base Course and the Surface Layers

- Borrow pits from the Trinidad sector to be used only between Trinidad and the Mamoré River:
Graded crushed stone from Cerro San Jorge (Deposit No.1.)

(3) Aggregates for Bridge Concrete

- Borrow pits from the San Borja sector:
 - Quoquibey River : Fine aggregates (sand).
Coarse aggregates (gravel). These aggregates should not be used for high-strength concrete.
 - Alto Beni River : Coarse aggregates (gravel).
- Borrow pits from the Trinidad sector:
 - Cerro San Jorge : Coarse aggregates (crushed stone, Deposit No.1.)
 - Blanco River : Fine aggregates (sand, Urubicha.)

4.4 Construction Schedule

Construction for improvement of the project road is scheduled to start in 1997 and end in 2000. The general construction schedule is shown in Table 4-4-1.

Table 4-4-1 Construction Schedule

Items	Quantity	1997	1998	1999	2000	Notes
Preparation work		—	—	—	—	
Stripping	1,347 ha	—	—	—	—	
Clearing and swamping	579 ha	—	—	—	—	
Removal of present culverts	930 m	—	—	—	—	
Installation of corrugated metal pipes	3,935 m	—	—	—	—	
Earthfill of the body	1,240,982 m ³	—	—	—	—	
Subgrade	373,709 m ³	—	—	—	—	
Shaping of the subgrade	2,159,903 m ²	—	—	—	—	
Ferry boat facilities	Global	—	—	—	—	
Bridges	10 bridges	—	—	—	—	Includes the Tijamuchi Bridge
Subbase layer	438,357 m ³	—	—	—	—	
Base layer	7,179 m ³	—	—	—	—	
Asphalt top layer	70,781 m ²	—	—	—	—	
Shoulder paving	20,223 m ²	—	—	—	—	
Protections	8,892 m	—	—	—	—	
Installation of vertical signals	Global	—	—	—	—	
Installation of horizontal signals	Global	—	—	—	—	
Ferry boat administration office	Global	—	—	—	—	

Equipment (Capacity)	Quantity	1997	1998	1999	2000	Notes
Bulldozer (21 ton)	26	—	—	—	—	
Backdigger (0.6 m ³)	6	—	—	—	—	
Tractor shovel (2.1 m ³)	4	—	—	—	—	
Dump truck (12 ton)	141	—	—	—	—	
Pneumatic tire roller (20 ton)	4	—	—	—	—	
Vibrating roller (20 ton)	2	—	—	—	—	
Motorgrader (3.7 m ³)	2	—	—	—	—	
Concrete mixer (0.6 m ³)	6	—	—	—	—	
Asphalt plant	1	—	—	—	—	
Asphalt finishing machine	1	—	—	—	—	
Stone crusher (complete set)	1	—	—	—	—	