6.3 CAPITAL, OPERATION COST AND ADDITIONAL INVESTMENT AND REPLACEMENT COST

6.3.1 Basis for Estimate

All applicable laws, working conditions, salaries, wages and equipment cost, commodities prices and unit price of construction are as of Oct. 1985 and not considered the escalation through construction and operation period.

Period of constructions: Construction and development period is expected five years, as two years for the detail Survey and feasibility study, one year for detailed design and financing and two years for construction.

Currency and interest: The following rate of exchange are used $1.00 =s/.14,000, $1.00=¥210 and interest for 9% per annum.

Material and expendable and machine parts etc.: Machines, electric equipment, steel pipes, electric wires, steel for buildings, vehicles necessary for operation will be imported from the abroad except equipment and commodities purchased in Peru and price in Peru are standardized with expectation of special favour of customs duty which will be deteriorated with the package purchases as follows:

FOB value (foreign ports) = Minesite value x 1.6

Salaries and wages: Their basic pays are established to which social security, paied vacation, overtime work, bonus etc. are added to obtain the following monthly pays used in the estimate.

General manager and mine manager	$2,000
Assistant mine manager	$1,000
Staff and doctor	$ 500
Employee and teacher	$ 200
Worker	$ 150

Concentrates hauling:

Hauling cost by truck	$18.0/wt (Mine to port Callao)
Handling loss	1.0%
Loading expenses	$7.2/wt
Tax	2.0% of total revenue
Commission	$1.5/t

6.3.2 Summary of Estimate of Capital Cost

Table 2.7 shows the detailed capital cost and it is summarized as follows.

Item	Total amount	$	($1,000) S/.
(1) Production, auxiliary and welfare etc.	25,211	7,825	17,386
(2) Construction Management etc.	1,602	817	785
(3) Inventory	200	21	179
(4) Contingency	1,891	606	1,285
Total (1-4)	28,904	9,269	19,635
(5) Detailed survey and feasibility study	3,095	175	2,920
(6) Detailed design etc.	451	451	-
(7) Interest during construction period	1,734	1,734	-
Grand Total (1-7)	34,184	11,629	22,555
(8) Working capital	2,195	2,195	-
Total Investment	36,379	13,824	22,555

6.3.3 Summary of Operation Cost

The operation cost is divided into production cost, concentrates hauling cost and ship loading. Table 2.8 shows the detailed operation cost and it is summarized as follow:

Item	Yearly cost ($1,000)	$/t ore
Mining	2,154	9.57
Concentration	1,936	8.61
Maintenance	172	0.76
Administration	943	4.19
Direct cost total	5,205	23.13
Concentrates hauling	1,259	5.60
Ship loading	499	2.22
Tax and commission	353	1.57
Total	7,316	32.52

6.3.4 Additional and Replacement Cost

During eight years after operation starts, $475,000 of additional investment for the second stages construction work of tailing pond and $2,402,000 of the replacement cost such as mining equipments, vehicles and common use vehicles are needed, making the total of $2,877,000. Table 2.9 shows the corresponding yearly expenditure.

Table 2.7 Summary of Investment Cost

($1,000)

	Item	Total			Year (-5 ~ -3)			Year (-2)			Year (-1)			Remarks
		Total	$	S/.	Total	$	S/.	Total	$	S/.	Total	$	S/.	
1	Mining	8,540	2,137	6,403	-	-	-	3,332	454	2,878	5,208	1,683	3,525	Mechanized Cut & Fill Method, 750 t/day
2	Concentrator	5,993	2,409	3,584	-	-	-	572	-	572	5,421	2,409	3,012	Capacity 825 t/day, Pb-Zn stright differencial flotation
3	Tailing pond	1,241	-	1,241	-	-	-	124	-	124	1,117	-	1,117	Capacity 2,140,000 m^3, sand & slime piling separated.
4	Power plant	3,769	2,321	1,448	-	-	-	121	-	121	3,648	2,321	1,327	Diesel generator, max output 2,500 kW, 5 units
5	Power distribution	643	329	314	-	-	-	-	-	-	643	329	314	Transmission voltage 2,200 V, voltage used 2,200V/220V
6	Communication	183	77	106	-	-	-	20	-	20	163	77	86	50 Wire telephones, radio 150-400MHz
7	Water supply	317	178	139	-	-	-	-	-	-	317	178	139	Pumped up from lake Quellaycocha, industrial 1,920 m^3/day, domestic 300 m^3/day
8	Repair shop	247	133	114	-	-	-	247	133	114	-	-	-	Mechanical & electrical shop
9	Auxiliary facilities	1,275	241	1,034	-	-	-	1,047	96	951	228	145	83	Road construction & repair 27.5 km, office, warehouse, mess, vechicles, etc.
10	Welfare facilities	2,845	-	2,845	-	-	-	903	-	903	1,942	-	1,942	Residential houses 274, quarters, clubs, shool, clinic, canteen, etc.
11	Lima head office	59	-	59	-	-	-	59	-	59	-	-	-	Office rental 250 m^2, vechicles, etc.
12	Construction facilities	99	-	99	-	-	-	99	-	99	-	-	-	Camp during construction 550 m^2, 75 kW diesel generator, etc.
	Subtotal (1-12)	25,211	7,825	17,386	-	-	-	6,524	683	5,841	18,687	7,142	11,545	
13	Construction management	904	357	547	-	-	-	394	157	237	510	200	310	Work management and supervision, Operation of 175 kW diesel generators (2) etc.
14	Lima head office	339	101	238	-	-	-	156	52	104	183	49	134	General administration, procurement, etc.
15	Oversea's commission	359	359	-	-	-	-	159	159	-	200	200	-	Oversea's expenses for financing and purchasing
	Subtotal (13-15)	1,602	817	785	-	-	-	709	368	341	893	449	444	
16	Inventory	200	21	179	-	-	-	-	-	-	200	21	179	2-month supply for mining and concentrator
17	Contingency	1,891	606	1,285	-	-	-	506	73	433	1,385	533	852	7% of total (1-16)
	Direct cost total (1-17)	28,904	9,269	19,635	-	-	-	7,739	1,124	6,615	21,165	8,145	13,020	
18	Detailed survey	3,095	175	2,920	3,095	175	2,920	-	-	-	-	-	-	Conducted at -5 & -4 yrs; tunnel 1,763 m, boring 4,365 m & feasibility study
19	Detailed design etc.	451	451	-	451	451	-	-	-	-	-	-	-	12 months x 10 persons, 20 day at site, conducted at -3 yrs
20	Interest	1,734	1,734	-	-	-	-	303	303	-	1,431	1,431	-	Interest 9% an annum. Capital = 1/4 investment required.
	Investment total (1-20)	34,184	11,629	22,555	3,546	626	2,920	8,042	1,427	6,615	22,596	9,576	13,020	
21	Working capital	2,195	2,195	-	-	-	-	-	-	-	2,195	2,195	-	For year (1), 30% of operation cost (excluding interest and depreciation cost)
	Initial investment total (1-21)	36,379	13,824	22,555	3,546	626	2,920	8,042	1,427	6,615	24,791	11,771	13,020	

Note: 1) Expenditure required by year was summed up on occurrence.
2) Detail survey and detailed design will be done by capital.

Table 2.8 Summary of Yearly Operation Cost

($1,000)

Item	Total			Labor cost			Material Cost			Expenses			$/t ore
	Total	$	S/.	Total	$	S/.	Total	$	S/.	Total	$	S/.	
1. Mining													
Mining	2,005.8	197.1	1,808.7	384.6	-	384.6	1,055.1	197.1	858.0	566.1	-	566.1	8.91
Geology	148.6	-	148.6	63.6	-	63.6	35.0	-	35.0	50.0	-	50.0	0.66
Subtotal	2,154.4	197.1	1,957.3	448.2	-	448.2	1,090.1	197.1	893.0	616.1	-	616.1	9.57
2. Concentration	1,936.2	321.5	1,614.7	127.8	-	127.8	944.2	321.5	622.7	864.2	-	864.2	8.61
3. Power plant	(1,449.5	54.4	1,395.1)	... Allocated to each department.									
4. Maintenance	171.9	-	171.9	66.0	-	66.0	31.0	-	31.0	74.9	-	74.9	0.76
5. Administration													
Central office	350.1	156.6	193.5	234.0	147.6	86.4	20.2	-	20.2	95.9	9.0	86.9	1.56
Welfare	396.6	-	396.6	137.4	-	137.4	43.0	-	43.0	216.2	-	216.2	1.76
Lima head office	196.0	52.2	143.8	102.0	49.2	52.8	17.0	-	17.0	77.0	3.0	74.0	0.87
Subtotal	942.7	208.8	733.9	473.4	196.8	276.6	80.2	-	80.2	389.1	12.0	377.1	4.19
Total	5,205.2	727.4	4,477.8	1,115.4	196.8	918.6	2,145.5	518.6	1,626.9	1,944.3	12.0	1,932.3	23.13
6. Concentrate hauling	1,259.5	-	1,259.5	-	-	-	-	-	-	1,259.5	-	1,259.5	5.60
7. Ship loading	498.7	-	498.7	-	-	-	-	-	-	498.7	-	498.7	2.22
8. Tax. commission	352.8	-	352.8	-	-	-	-	-	-	352.8	-	352.8	1.57
Grand total	7,316.2	727.4	6,588.8	1,115.4	196.8	918.6	2,145.5	518.6	1,626.9	4,055.3	12.0	4,043.3	32.52

Table 2.9 Summary of Additional Investment and Replacement Cost

($1,000)

Year	Additional invest.	Replacement cost			Grand total
		Mining equipment	Common vehicle	Total	
1	-	-	-	-	-
2	-	20	-	20	20
3	-	-	19	19	19
4	-	173	20	193	193
5	150	498	255	753	903
6	150	648	100	748	898
7	175	591	19	610	785
8	-	39	20	59	59
9	-	-	-	-	-
10	-	-	-	-	-
Total	475	1,969	433	2,402	2,877

CHAPTER 3 INFRASTRUCTURE

CHAPTER 3 INFRASTRUCTURE

In this chapter, the problems and current state of the infrastructure in the vicinity of Iscaycruz and related areas will be described for the purposes of planning the utilization and improvement of facilities for transportation, electric power, water supply, communications, labor supply, and a mining camp.

1. TRANSPORTATION (ROAD SYSTEM)

1.1 DEMAND FOR TRANSPORTATION

Demands for transportation which will arise in connection with the development and operation of the mine are summarized as follows:

(1) Transportation of construction materials from the places of supply to the mine to be developed.

(2) Transportation of various kinds of machinery and equipment from Callao Port (for imported goods) and from the places of supply (domestic goods) to the mine to be developed.

(3) Transportation of materials, equipment and fuels for mine operation from Callao Port or from the places of supply to the mine to be developed.

(4) Transportation of foods and other daily necessities for the residents of the mining camp from the places of supply to the mine to be developed.

(5) Transportation of Pb and Zn concentrates from the mines to Callao Port.

(6) Transportation of residents from the mine camp to other places (Lima, Churin, etc.) for the purposes of economic and social exchange with other people outside the area.

Of these demands, the transportation of concentrates produced is the greatest by volume. Materials, equipment and fuels necessary for mine operation, and daily necessities can be transported economically by use of the returning concentrate transport vehicles. For residents in the mine camp to get to other places, the mining company may be required to provide busses for the time being, in order to take them to Oyon where regular bus services are provided.

1.2 ROAD CONDITIONS

The route for transporting goods from Lima, which will serve as the base for the procurement and transportation of materials and equipment during the development work and mine operation, and from Callao, which is the concentrate exporting port, to the mine is shown in Fig. 3.1, and lengths and altitudes of each stage of this route are as shown in Fig. 3.2.

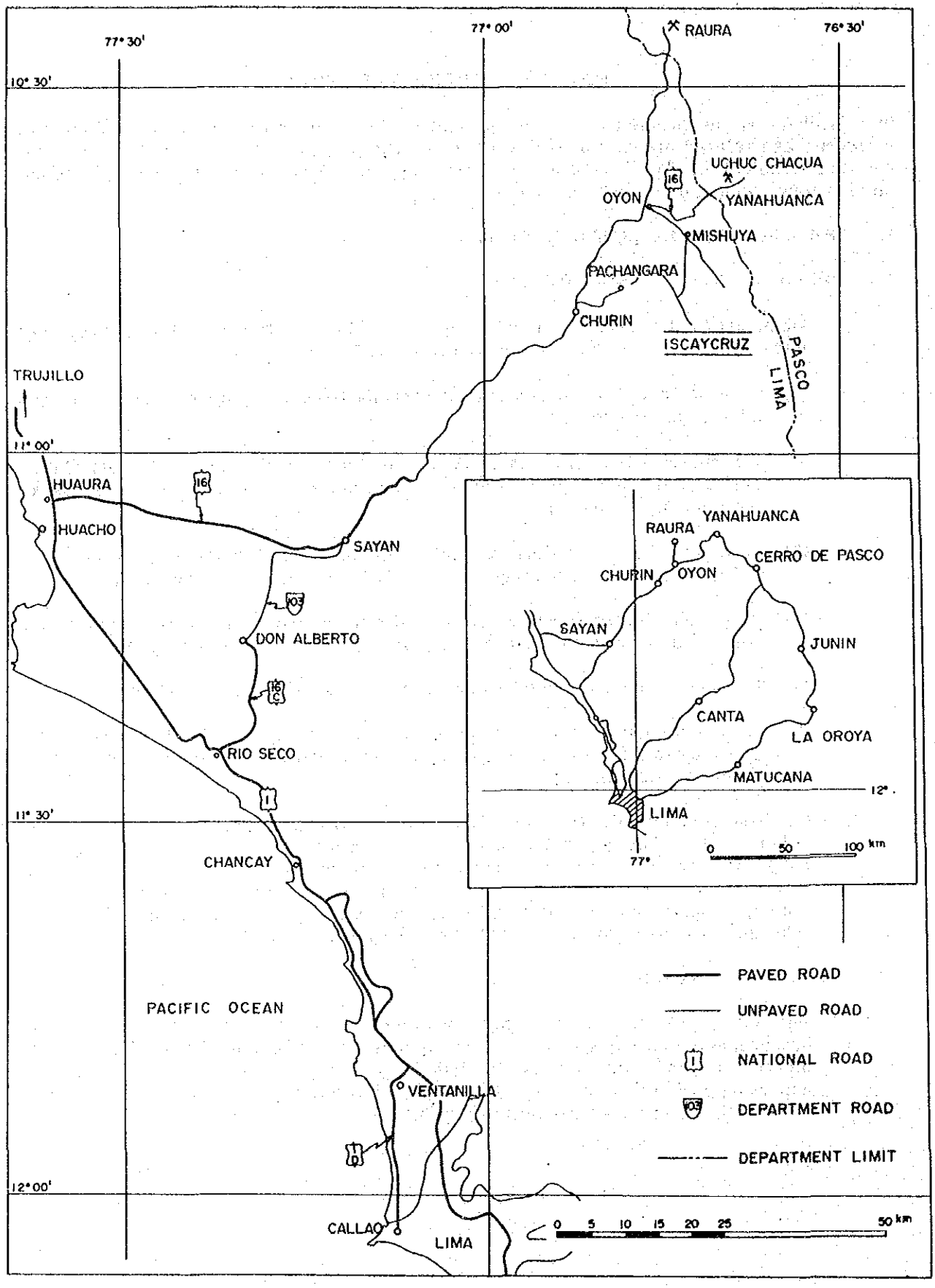


Fig. 3.1 Transportation Route

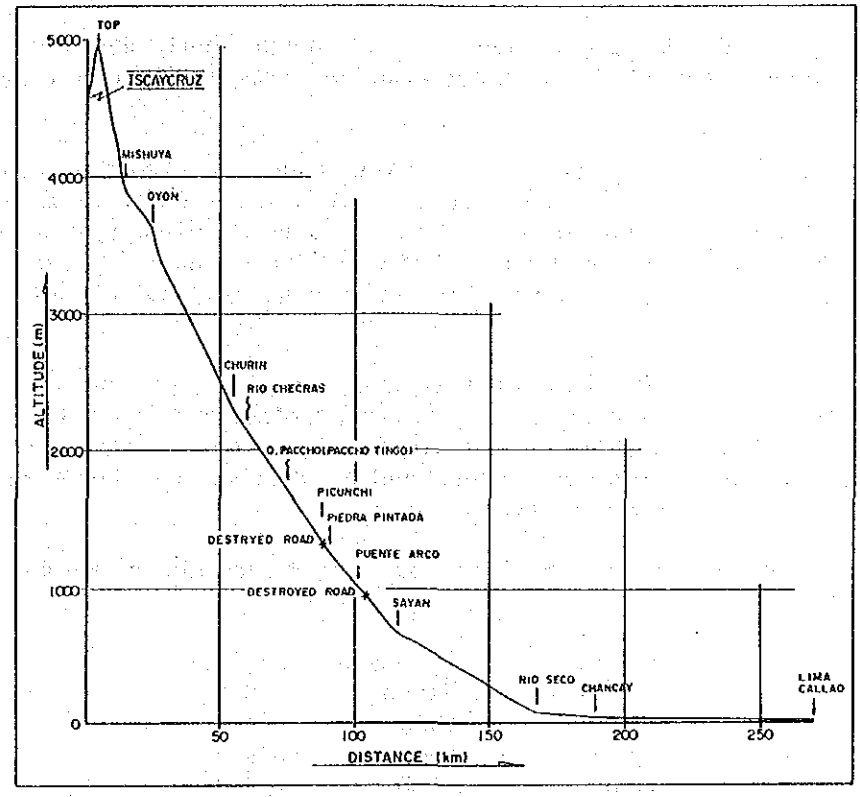


Fig. 3.2 Distance and Altitude of the Transportation Route

The section of the Pan American Highway (National Road No. 1) between Lima and Rio Seco is asphalt-surfaced, consisting for the most past of two lanes in both directions. To the north of Rio Seco, where only one lane is provided in either direction, the expansion to two lanes is now under way.

National Road No. 16-C running from Rio Seco northwards to Sayan is paved only as far as Don Alberto, and unpaved in the section from Don Alberto to Sayan, where it is known as Prefectural Road No. 103.

National Road No. 16 running along the Huaura River from Sayan to Churin is paved only as far as Puente Arco, 15 km to the northeast of Sayan, and unpaved ahead of this point. A section of about 700m located 12 km from Sayan on the way to Puente Arco has been destroyed by flooding of the Huaura River, and vehicles are forced to drive along the broad riverbed there. At Picunchi, 29 km from Sayan, vehicles are likewise forced to run along the riverbed of the Huaura River for a section of about 500 m, where the reconstruction of the road is, however, under way (as mentioned below), and will be completed soon.

At these points of road damage, vehicles may be unable to pass through owing to the flooding of the Huaura River in the rainy season, especially from January to March. The period of traffic stoppage is on average 15-20 days annually, mostly in March.

At Paccho Tingo, 43 km from sayan, the junction of the Paccho River and the Huaura River, where a large amount of earth and sand sediment carried by the Paccho River may block the road in the rainy season, improvement work is now under way to prevent blockage, and is about 80% complete.

A tunnel located 2 km from Paccho Tingo, though short, should be taken into account when planning the transportation of large-sized machinery for mine development.

The section of National Road No. 16 between Churin and Oyon is unpaved and as narrow as 3-4 m. From Oyon to Iscaycruz, it is necessary to leave the national road and take a municipal road at Oyon leading to Mishuya, the center of a number of small-scale coal mines. Trucks of 25-30t capacity can reach Oyon from the Pan American Highway and trucks of at least 20t capacity can reach Mishuya.

On the road from Mishuya to Iscaycruz, which was constructed for the Cooperative Mineral Exploration already conducted, and which has an average gradient of 1:10 in parts, trucks of more than 6t capacity cannot pass through at present. The construction and reconstruction of roads will therefore be needed in this section when developing the mine.

The distances between stages of the route mentioned above are summarized as follows:

Callao	-	Rio Seco	102 km
Rio Seco	-	Sayan	52 "
Sayan	-	Churin	61 "
Churin	-	Oyon	30 "
Oyon	-	Mishuya	10 "
Mishuya	-	Iscaycruz	15 "
		Total	270 "

1.3 ALTERNATIVE ROUTES

As already mentioned, the road may be partially blocked by the flooding of the Huaura River along the section between Sayan and Churin in the rainy season, and every year during this time it is probable that vehicles are unable to pass through, though for a short period. As an alternative route during such traffic stoppage, it is possible to go from Oyon to Lima and Callao via National Road No. 16 and Yanahuanca--Cerro de Pasco--Canta. In fact, Raura Mine and Uchuc Chacua Mine near Iscaycruz use this route in case of emergency.

From Iscaycruz to Churin, it is possible to take a route via Pachangara avoiding Oyon. The existing road between Churin and Pachangara is so narrow that a jeep can barely get through. With a gradient of 1:10 on average, this road is in a similar condition to that of the section between Mishuya and Iscaycruz. Improvement work will be required on both the gradient and width of the road, if it is to be used as a part of the alternative route. Between Pachangara and Iscaycruz, where no road suitable for vehicles exists, a new road may have to be newly constructed. Its length will be 15 km, if the road is constructed with a gradient of 1:15, due to an altitude difference of about 1000 m.

Further study is needed as to the selection of the route.

1.4 MAINTENANCE OF ROADS

The greatest problem for the development and operation of a mine in Iscaycruz would be the maintenance of the two short stretches on the road between Sayan and Churin, which are likely to be destroyed by the flooding of the river in the rainy season. They are located 12 km and 29 km to the northeast of Sayan, extending 700 m and 500 m, respectively. As part of National Road No. 16, they are under the control of the Ministry of Transportation and Communication; the latter stretch is under reconstruction, so that a 3 km diversion is scheduled to be completed by the end of 1985; there has been, however, no plan for improving the former. In addition to these two, there are many other places which need bank protection works and the elevation of the road surface to protect it from the Huaura River between Sayan and Churin. The riverbed of the Huaura River has risen remarkably over this section of the route due to sediment (earth and sand) flowing out of the Checras River, a tributary of the Huaura River, and the buried remains of the old national road can be seen at several points.

It is obvious from these observations that, in this section, the road has been repeatedly blocked by floods at points where earth and sand tend to accumulate because of the small difference in altitude between the riverbed and the road, and the gentle gradient of the riverbed and the widening of its course. Such a phenomenon is naturally likely to occur again, and therefore, efforts should be made to seek a permanent solution, instead of merely remedial works following the occurrence of damages.

In the section between Oyon and Iscaycruz traffic may be stopped by landslides in the rainy season. This is so because unstable piles of sand exist at many points. Landslides, however, do not cause so serious disturbance to traffic as the flooding of the river does, and the repair work is relatively easy.

In Peru, although public roads such as national and provincial ones are maintained by the public agencies concerned, the users of roads often share in the cost of restoration or repairs. In the case of the restoration of the road between Sayan and Oyon, Raura Mine and Uchuc Chacua Mine have supplied civil engineering machinery and workers. To budget for this, Raura Mine allots U.S. $40,000-50,000 every year. Therefore, it will be necessary that the Iscaycruz mine considers participating in repair work or sharing in the cost according to its production scale.

1.5 CURRENT TRANSPORTATION CONDITIONS

At present, products from Raura Mine, Uchuc Chacua Mine and many other small-scale coal mines in the neighborhood of Iscaycruz are carried by truck to Callao, Lima, Chimbote and other ports via National Road No. 16. From Raura Mine to Callao (a distance of 285 km), trucks of 30 or 20t capacity are used, taking about 18 hours and 12 hours, respectively. Between Oyon and Lima, there is a regular bus service operating twice a day; and from Raura Mine to Lima, a bus service is operated twice a day exclusively for mine workers.

National Road No. 16, which is an extremely important route for local industry and residents, has a daily traffic of 120 vehicles between Churin and Raura, and 140 vehicles between Sayan and Churin; moreover, the traffic amounts to about 1200 vehicles daily in the section from Sayan to Rio Seco, Huaura, and Huacho, which is one of the leading agricultural zones in Peru.

2. ELECTRIC POWER

2.1 THE CURRENT SITUATION IN THE REGION

The system of power supply in the vicinity of Iscaycruz is not extensive, except to supply mines in operation.

As for public power plants, only small-scale hydro-electric or diesel power stations exist in Churin, Moroc, and Oyon including those under construction, and the range of power distribution is extremely limited. Two mines in operation, namely Uchuc Chacua (Ag mine, output 1,000 t/day) and Raura (Cu, Pb, and Zn mine, output 1,800 t/day) have their own power plants for mining operation, supplying power for production and residential uses.

The Paton hydro-electric power plant, at Uchuc Chacua Mine, is scheduled to supply a part of the generated power to Oyon, and the construction of power transmission lines is now under way. According to the plan, a maximum of 100 kW will be supplied.

The current situation of power plants and power transmission lines is as shown in Fig. 3.3 and Table 3.1.

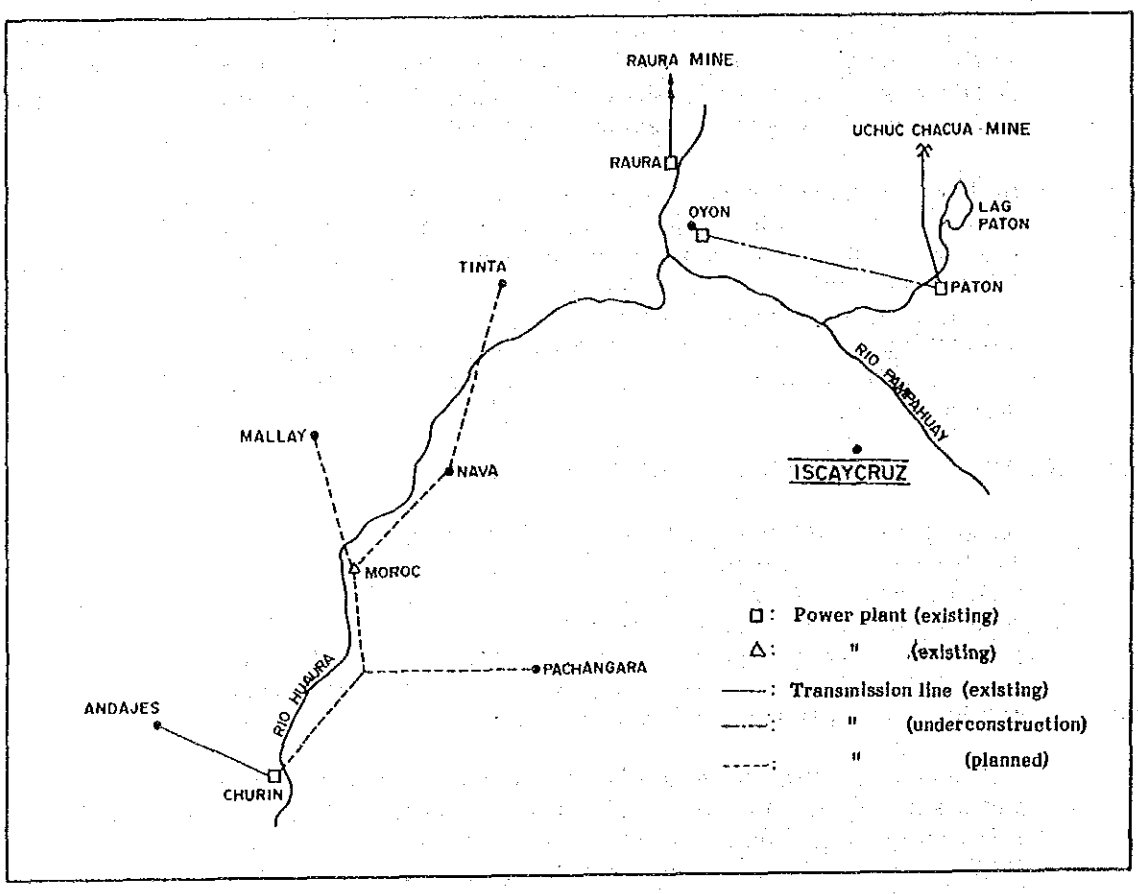


Fig. 3.3 Power Plants and Transmission Lines

Table 3.1 Power Plants

Power Plant	Generator		Remark
	Hydraulic	Diesel	
Churin	72kW x 1	72kW x 1	Operated 8:00 - 24:00
Moroc	250kW x 1		Under construction
"	250kW x 1		Planned
Oyon		50kW x 1	
Paton	2,164kW x 1	1,100kW x 1	For Uchuc Chacua mine's exclusive use
"	500kW x 1	800kW x 2	"
"	800kW x 1		"
Raura	1,000kW x 4	1,200kW x 1	For Raura mine's exclusive use
"		750kW x 1	"

2.2 DEVELOPMENT PROJECTS

An extensive survey in the basin of the Huaura River is being conducted by ELECTRO Peru, in order to plan the construction of several hydro-electric power plants. If they are actually constructed, Iscaycruz will be able to utilize them as sources of electric power; the possibility of this, however, is very remote, and it is not certain whether even one of them will have been constructed by 1995. For this reason, the mine development will involve the construction of a power plant exclusively for mining operations.

The outline of projects for hydro-electric power stations which are now under study is as shown in Table 3.2 and Fig. 3.4.

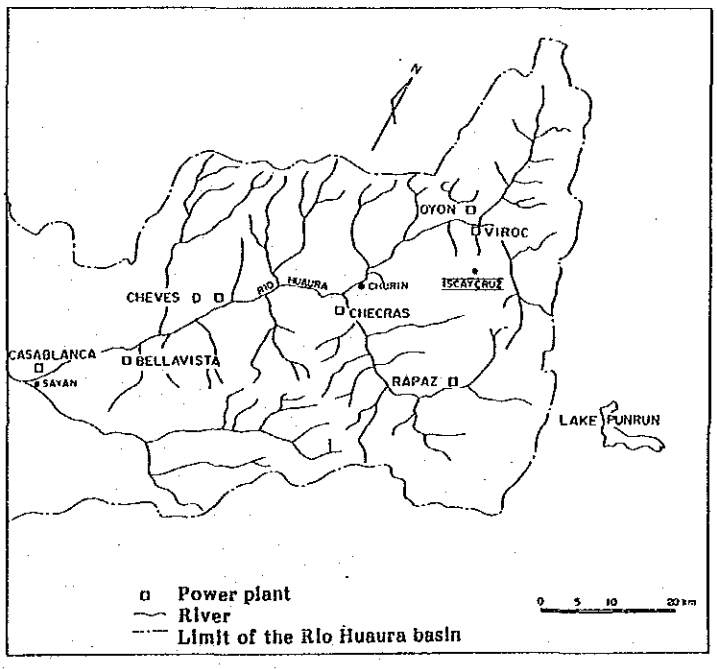


Fig. 3.4 Location of Hydro-electric Plants

Table 3.2 Hydro-electric Projects

	Plant site	Channel (km)	Flow Volume (m^3/sec)	Head (m)	Capacity (MW)	Annual Generation (GWh) Without use of Lake Punrun		With use of Lake Punrun	
							Total		Total
XVII	Casablanca	13.7	22.48	238	45.5	175	325	374	395
XII	Bellavista	18.1	20.96	360	64.1	243	453	541	564
X	Cheves D	28.8	20.96	677	121.0	462	858	1,017	1,059
VI	Checras	45.6	13.50	1,075	123.0	473	879	1,081	1,081
II	Oyon	18.4	2.91	761	18.8	72	134	-	-
III	Viroc	9.3	1.73	563	8.3	32	59	-	-
IX	Rapaz	29.0	1.59	946	12.8	49	91	-	-

3. WATER SUPPLY

3.1 WATER UTILIZATION IN THE HUAURA RIVER BASIN

Most of the water in the Huaura River basin is utilized for irrigation. The main area irrigated is a zone extending from Sayan to Huaura and Huacho along the river, and to Don Alberto to the southwest of Sayan.

This zone along the Huaura River is one of the major areas for sugar cane production in Peru, and some of the areas in the middle and upper reaches of the river and along its tributaries are suitable for irrigated agriculture. As mentioned below, the arid land on the Pacific coast side needs irrigation for agricultue; there are many channels to convey water from the mountains to the coastal area.

Water utilization for mining is also important in connection with water catchment and drainage. Mines in the neighborhood of Iscaycruz utilize many lakes located in this mountainous area in order to store water for industrial and domestic use and to generate hydro-electric power. In the mountainous area, precipitation is very low in the dry season; for example, the average rainfall from May through July at Uchuc Chacua Mine is no more than 10 - 20 mm. Natural lakes play a major role in compensating for the shortage of river water during the dry season.

Small-scale hydro-electric power generation to supply electric power to local communities, as well as power generation exclusive for mines, is one of the important uses of water resources in this region. ELECTRO Peru is now conducting an extensive study in the Huaura River basin in order to construct several hydraulic power plants.

Communities located in the middle and upper reaches of the Huaura River are generally small, with populations numbering several thousands. Larger communities have water supply facilities equipped with chlorination equipment to supply water for domestic uses. There are, however, no public sewer facilities to treat waste water discharged from households.

Waste water from the Iscaycruz mine flows into the Pachangara River downwards and joins the Huaura River near Churin. On the other hand, the supernatant water discharged from the tailing pond of Iscayruz Mine flows into the Yanahuaino River, flows down close to Cuary, becomes the Cayash River, joins the Checras River, flows downwards near Lagusaura, and joins the Huaura River below Churin.

Thus, on the way to the Huaura River, waste water discharged from mines passes through several communities which conduct irrigated agriculture. This is why adequate attention should be paid to the control of waste water.

3.2 HYDROLOGICAL AND METEOROLOGICAL CHARACTERISTICS OF THE HUAURA RIVER

Hydrological and meteorological data in Peru are collected and compiled by the Meteorological and Hydrological Agency (SENAMHI), and the isohyet chart for the basin of the Huaura River prepared by SENAMHI is shown in Fig. 3.5.

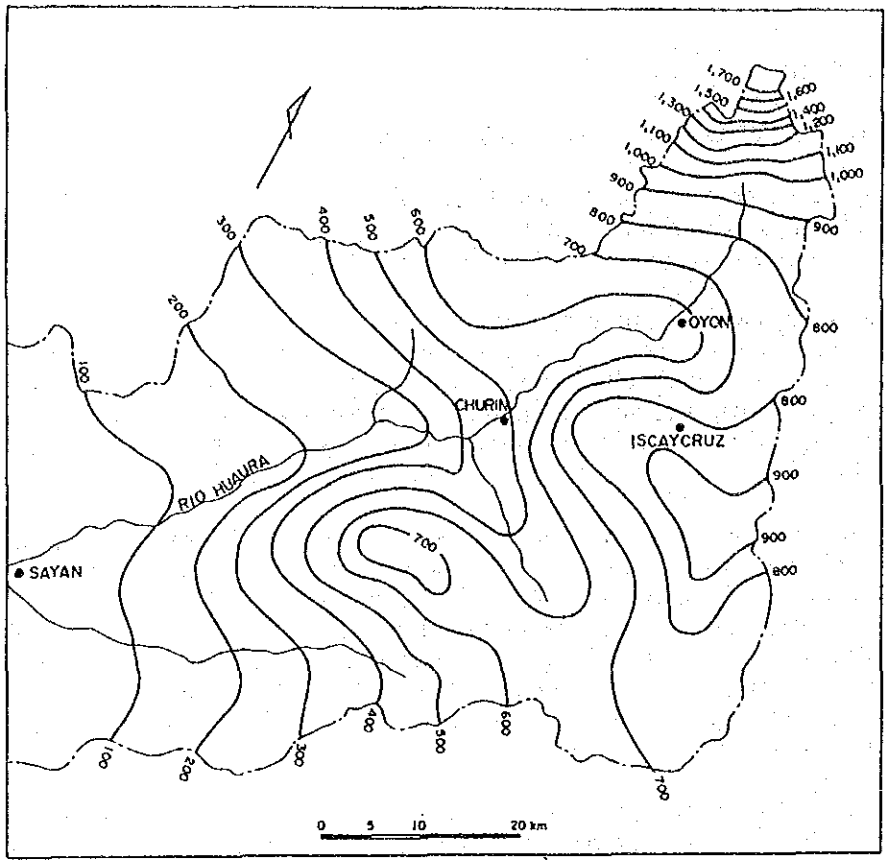


Fig. 3.5 Isohyet Chart (unit: mm)

As seen in the chart, the Pacific coastal area below the Huaura River has extremely little rain, less than 100 mm throughout the year, and is a desert area. This is so because temperature in the upper air is so low, owing to the Humbolt Cold Current flowing northwards off the coast of Peru, that the atmosphere cannot contain a large amount of water vapor. If the air mass flows towards the continent, its temperature rises and its humidity falls, resulting in low rainfall.

Whereas in the lower reaches of the Huaura River, rainfall is very little, in the middle and upper reaches, as the altitude rises, a rising air current occurs and rainfall gradually increases, as can be seen from the chart. For example, annual precipitation is 100 mm near Sayan, 500 mm in Churin, and 600 mm in Oyon. While the annual precipitation is 1,700 mm in the northernmost of the upper reaches of the river, it is 800 mm in the southernmost of them at 5,000 m above sea level; thus there is no sharp increase in precipitation.

The land area of the Huaura River Basin is 5,700 km^2, and its altitude ranges from 0 m to 5,685 m; the basin area higher than 3,000 m above sea level accounts for 45% of the total area, and the basin area higher than 4,000 m above sea level accounts for 31%. Because the majority of the basin is at high altitude, the amount of water flowing in the Huaura River is kept constant.

According to data from the hydrological analysis by SENAMHI, the monthly average water flow of the Huaura River along the section Sayan - Casa Blanca - Alco is minimal or 11.5 m^3/sec in August, and maximal or 64.6 m^3/sec in March; and the annual average is 27.6 m^3/sec. The ratio of the annual runoff to the annual rainfall, or runoff coefficient, ranges from 0.43 to 0.58 (1970 - 1976). The specific discharge in liter/sec/km^2, or the amount of water flowing per unit area of the basin, is 4.2 in August, 23.9 in March, and 10.2 on annual average. From these data, runoff is estimated at 320,000 m^3/km^2 throughout the year.

The above mentioned hydrological characteristics of the Huaura River Basin may possibly provide an index for considering water demands in Iscaycruz.

3.3 WATER DEMANDS IN ISCAYCRUZ

To consider water demands in Iscaycruz, the potential supply must be evaluated on the basis of the basin area, precipitation, runoff coefficient and storage of Quellaycocha Lake, and compared with the required amount for mine operation.

The basin of Quellaycocha Lake, which lies partly to the southwest of the lake, extends mainly to the north-east with a total area of 1.39 km^2. Although recorded data on precipitation in the basin are not available, the annual rainfall is 800 mm according to the above-mentioned chart. Values based on isophyet are macroscopic, however, and it is preferable to refer to precipitation data collected at observatories in the neighborhood. The annual average precipitation observed by neighborhood observatories is shown in Table 3.3 which was compiled from data collected by SENAMHI.

Table 3.3 Average Annual Precipitation at Adjacent Observatories

	Raura	Pachangara	Paton	Tablades	Uchu Cha.
Altutude above sea level (m)	4,900	3,600	4,150	4,700	4,500
Year	1970-76	1965-82	1971-75	1971	1971-80
Maximum (mm)	1,894	1,294	976	-	1,231
Minimum (mm)	733	458	761	-	868
Average (mm)	1,327	740	804	763	1,035

As seen in this table, there is a tendency for precipitation to increase as altitude rises, excluding the case of Tablades where data are only available for one year. Since the basin of Quellaycocha Lake extends in altitude from 4,600 m to 4,900 m, the annual rainfall in the basin may be greater than the value based on isohyet, that is 800 mm, and is estimated as possibly around 1,100 mm.

As already mentioned, the runoff coefficient was calculated as 0.5 based on the amount of water flowing in the Huaura River near Sayan. At Iscaycruz, however, the coefficient may be higher than this value because of relatively higher precipitation and lower temperature, and is estimated as possibly about 0.7, combining surface runoff with underground runoff.

Based on these estimates, the annual amount of water flowing into the lake is calculated at 1,080,000 m^3 by the following formula:

$$\frac{1{,}100 \text{ mm/year}}{1{,}000 \text{ mm/m}} \times 1.4 \text{ km}^2 \times (1{,}000 \text{ m/km})^2 \times 0.7 = 1{,}080{,}000 \text{ m}^3\text{/year}$$

The extra annual amount of water required for mine operation is 576,000 m^3 for industrial use and 109,500 m^3 for domestic use, totaling 685,500 m^3. Thus, the annual supply of water exceeds the demand, and it may be safe to say that there will be no problems in water supply to mine operation in terms of the annual total amount available.

The yearly and seasonal fluctuations of precipitation should be taken into account, however. It is highly probable that the annual rainfall may amount no more than 500 mm once every ten years in this region. In this case, the annual amount of water flowing into Quellaycocha Lake would be reduced to 490,000 m^3, resulting in a shortage of 195,500 m^3 below demand. This shortage, however, may possibly be offset in a drought year by the storage of the lake. The area of the lake is about 0.24 km^2, and the average depth is estimated at 10 m; accordingly, the storage is estimated at 2,400,000 m^3.

According to the data from SENAMHI, the monthly precipitation observed by neighborhood observatories is as shown in Table 3.4, showing a sharp difference between the dry season (April through November) and the rainy season (December through March), being especially low from June through August. During the dry season, therefore, storage must be utilized. For this reason, it is essential to catch and store flowing water in the lake as much as possible during the rainy season, to cope with these seasonal fluctuations.

Table 3.4 Monthly Precipitation

(unit: mm)

	1	2	3	4	5	6	7	8	9	10	11	12
Paura	198.5	175.4	195.7	130.5	33.7	37.1	21.0	47.7	84.9	132.0	80.1	157.8
Pachangara	139.1	132.4	156.1	57.0	13.1	1.1	7.2	5.0	20.8	56.9	62.8	101.8
Paton	130.0	121.3	153.4	75.5	24.8	6.0	4.9	27.1	41.6	72.3	58.6	88.5
Uchuc chacua	166.8	219.2	225.1	121.5	35.3	11.3	3.5	10.0	33.5	62.3	62.6	121.6

Utilizing the lake as a reservoir to compensate for seasonal fluctuations as mentioned above may requie efforts to be made so that the current maximum level of water in the lake may rise further during the rainy season. In connection with this, it should be noted that a considerable amount of water currently flows out of the lake into the Pachangara River in the rainy season.

To control the storage and level of Quellaycocha Lake, further study must be carried out, to record precipitation in the basin, and to make a survey of the depth of the lake together with a detailed topographical survey of the vicinity of the lake, in order to investigate the correlation between water level and storage quantity.

4. COMMUNICATIONS

In Peru at the present time, while cable telephones and microwave circuits are extensively installed in the Pacific coastal area and between the main cities, communications are still poor in most parts of the mountainous area. Public communication facilities in the region concerned are also inadequate, and projects for expanding and improving such facilities are now suspended as mentioned below.

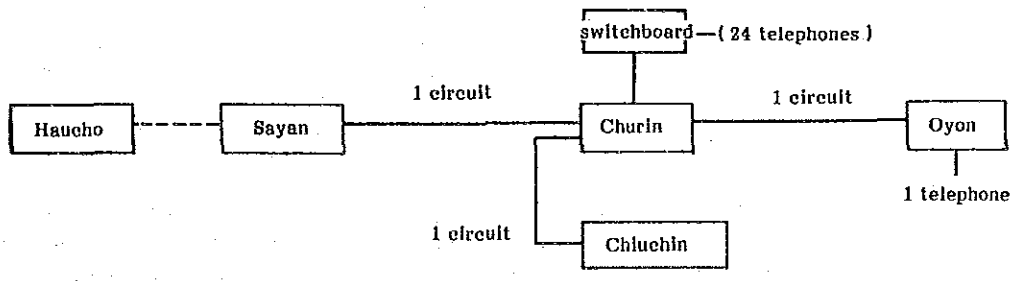
Churin: There is a telephone office connecting with 24 exchanges in the town. The office is equipped with a manual switchboard having a capacity of 50 circuits. The Public Telegram and Telephone Corporation (ENTEL Peru) cannot provide adequate service between Sayan and Oyon in many cases, because it has only one circuit which is so poorly installed that the line is often dead, and is only open for limited hours (from 9:00 to 21:00).

Chiuchin: There is only one circuit via the Churin Telephone Office.

Oyon: Only one circuit is installed via the Churin Telephone Office, and there are no public or private switchboards or telephone equipment except one telephone installed in the town office.

Raura and Uchuc Chacua Mines: There are cable telephone facilities within the mining area, but they have no connection with ENTEL - Peru's communication networks. To contact the outside (Lima), a special radio telephone is used.

ENTEL Peru's Communication Network in the Region:



5. THE LABOR FORCE AND MINE CAMP

5.1 LABOR FORCE

To develop a mine, the existence of potential labor force in the neighborhood should first be established.

The region concerned belonged formerly to Cajatambo Province, Lima Department, but some districts in the basin of the Huaura River separated from the province and formed Oyon Province in October, 1985. Oyon Province is principally divided into six districts, namely Pachangara (with its center in Churin), Oyon, Andajes, Caujul, Navan, and Cochamarca. Of them, Pachangara and Oyon are considered to have close relations with Iscaycruz. Population in these districts is shown in Table 3.5 and 3.6 based on the results of the census carried out in June, 1981.

Table 3.5 Population

	Population			Urban			Rural		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Pachangara	3,339	1,659	1,680	1,766	867	899	1,573	792	781
Oyon	8,354	4,098	4,256	6,304	3,101	3,203	2,050	997	1,053

Table 3.6 Working Population

	Working Population (Age 6-15)			Employed			Unemployed		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Pachangara	1,022	798	224	1,003	785	218	19	13	6
Oyon	2,449	2,010	439	2,304	1,920	381	145	90	55

Although these tables include no data on unemployed persons over 15 years of age, the unemployment rate in this category is estimated at 3.7%, almost the same as that for men aged 15 or less, according to our interviews with local officials. Information obtained at the Oyon Town Office indicates that there are about 100 men between 18 and 40 years of age seeking work in Oyon District.

The personnel required for mine operation is estimated at: 30 staffs, 66 employees, and 304 laborers, totaling 400. Of the (unskilled) laborers required, about 25% may be probably recruited within the region. Regarding the remaining laborers and employees, who are required to have working experience in mining, a further detailed survey has to be carried out to establish the potential supply. Oyon District, where two non-ferrous metal mines, that is, Raura and Uchuc Chacua, and many small-scale coal mines are located, offers good potential for supplying experienced mine workers.

5.2 MINE CAMP

5.2.1 The Location of the Mine Camp

For the site of the mine camp, three places, namely, Iscaycruz Mine, Pachangara and Oyon, are conceivable candidates. Of them, Pachangara and Oyon have already-established communities with service facilities such as schools and clinics; moreover, both of them, located at about 3,600 m above sea level, are more suitable than Iscaycruz (which is about 4,700 m above sea level) in terms of oxygen density and temperature, critical factors for human life.

Nevertheless, if the mine camp is constructed in either of these existing communities, workers will have to travel to the mine using a bus service, taking more than an hour one way. Judging from the scale of the mine to be developed, it would be extremely difficult and unrealistic to transport 400 mine workers everyday by bus. The mining camp should preferably be constructed as near the site of production as possible, because mine operation will be carried out at two or three locations. If Pachangara is selected for the camp site, it will involve the problem of constructing a road about 15 km long for the bus service to Iscaycruz.

At Raura Mine near Iscaycruz, about 950 mine workers and their families live at an altitude of 5,000 m; likewise at Uchu Chacua Mine, about 500 mine workers and their families live at an altitude of 4,500 m. Thus, though disadvantaged by its high altitude, Iscaycruz is still a possible site for the mine camp, if no other candidate is more suitable.

For the site of the mine camp, it would be reasonable to choose the northern area near Quellaycocha Lake, which is separated from the production facilities in the southern part by a 4,800-m ridge. This is so because separating the living quarters from the production site by a natural ridge will secure a good living environment. Distance between the two place is about 3 - 4 km, short enough for workers to commute by foot.

Around the lake there is a suitable stretch of land of 20 ha, comprising a gentle slope and flat ground. This area is large enough to build a mine camp for a total of 1,500 mine workers and their families.

5.2.2 The Location of Facilities

The mine camp must have houses and social service facilities for education, medical care, recreation and shopping, for the mine workers and their families. The residential area should preferably be divided into two parts, as commonly observed in Peruvian mines: one for employees and laborers, and the other for the staff. Social service facilities will need to be located at an equal distance from both of the two residential quarters.

If Quellaycocha Lake is to be used as a source of water for domestic use, the two residential areas must be properly chosen so that waste water from the areas does not flow into the lake. Therefore, it is advisable to locate the residential area for employees and laborers (which will be the larger in housing area as well as in population) on the north side of the lake; and to locate the residential area for the staff on the slope to the south of the lake, with drainage properly installed, although this scheme is likely to have some effect on the lake. Since the staff are few in number, there is no extensive construction involved in installing drainage equipment to serve their residential area. Social service facilities should be located to the northeast of the lake.

This disposition of facilities will accomplish the separation of the residential area for employees and laborers from that for the staff, and also give both of them equal access to social service facilities, while minimizing the pollution of the lake water.

CHAPTER 4 OVERALL EVALUATION

CHAPTER 4 OVERALL EVALUATION

1. FINANCIAL AND ECONOMIC EVALUATION

1.1 SIGNIFICANCE AND METHODS

In this section, financial and economic evaluation will be made in terms of the feasibility of exploiting lead and zinc deposits recently discovered in Iscaycruz, Peru. Financial evaluation involves the consideration, from the standpoint of investors, of whether or not investment in the development project will bring about satisfactory returns in the course of continuing operations; and economic evaluation involves consideration, independently of the interests of parties involved in the development, of whether or not such investment may make a greater contribution to the growth of the national economy than other potential investment opportunities.

These two types of evaluation, in adsdition to the assessment of effects on the local communities as described in the next section, are extremely significant in terms of the feasibility study. If the result of financial evaluation is negative, it suggests that the approach to the development should be reconsidered, or that a new assistance policy should be adopted by the Peruvian government. If the result of economic evaluation is negative, it suggests that the government should not promote the development unless political considerations, such as the expansion of employment in the area concerned, are brought to bear.

The financial and economic evaluation is based on the following assumptions besides the estimated costs for development and operation which are presented in Chapter 2.

(1) The concentrates which will be produced and sold as a result of the development are zinc and lead concentrates (containing a small amount of silver), and all of them shall be exported.

(2) The mine shall be managed by a special mining company (Empresa Minera Especial), and its capital accounting for about 25% of investment funds. It is assumed that the remaining 75% of the funds are borrowed over the long term.

(3) Empresa Minera Especial may be given incentives by the government, and the current system is assumed to remain unchanged in the future.

(4) In consideration of currently high inflation rates, the currency employed for analysis shall be the U.S. dollar, and not the Soles, the domestic Peruvian currency. The special mining company is allowed to account in dollars.

(5) The results of financial and economic evaluation shall be represented as a financial internal rate of return and an economic internal rate of return, respectively.

Based on these assumptions, we will first outline the methods of financial and economic evaluation used in this report, and then the various bases for and the results of the calculation of financial and economic internal rates of return will be presented.

1.1.1 Financial Evaluation

The procedure for financial evaluation in this report runs thus. First of all, it is assumed that the mining company will succeed in maximizing its profits by taking advantage of incentives as well as by considering the various conditions for future mine development and operation. The future profit and loss, and the income and expenditure of funds under this management are estimated. On the basis of cash flows given by such estimation, the DCF (Discounted Cash Flow) formula is used to calculate an internal rate of return as against the total investment, and an internal rate of return as against equity capital.

In the case of the former, investing entities include not only shareholders but also financing organizations, and it is important that the payment of interest and the repayment of loans, both of which are included as costs in company accounting, are a source of income for the financial organizations. In the case of the latter, on the other hand, the payment of interest and repayment of loans are not included in calculating the cash flows, which consists only of the company's accounting surplus. Dividends to shareholders, which will be covered by the surplus, are not estimated in calculating the income and expenditure of funds in this report, but are merely assumed to be paid out of the surplus. It should be noted that the internal rate of return as against the entire investment when calculated in this way exceeds the rate as against equity capital only when it is higher than the rate of interest at which funds are borrowed.

Financial costs and benefits which constitute cash flow correspond to expenditure and income based on domestic market prices and are included in company accounting, but careful attention should be paid to the fact that some of the items which are included as costs in company accounting do not constitute cash expenditures. To be exact, these are the depreciation and reinvestment allowances. Both are regarded as costs in the calculation of pre-tax profits on the basis of which corporate income tax is imposed, but they are not in fact paid out by companies, so that they do not involve cash expenditure. For this reason, they are not included in financial cost. As already mentioned, the payment of interest and the repayment of loans are not included in such cost, when the entire investment is being considered. In this case, they are cash expenditure on the part of shareholders, while they are cash income for the financing organizations and they offset each other.

The internal rate of return is given by the value of r (the discount rate) which satisfies the following formula:

$$\sum_{t=0}^{T} \frac{(\text{income})_t - (\text{expenditure})_t}{(1+r)^t} = 0$$

Where

t = total number of years since the start of investment,

and T = total years to come until the end of the project.

1.1.2 Economic Evaluation

Economic evaluation, which is also called the social cost-benefit analysis, consists of calculating economic benefits and costs based on "shadow prices"

(also called "accounting prices") assessed from the point of view of the national economy, instead of on domestic market prices, in the calculation of cash income and expenditure by the DCF formula. Cost-benefit analysis is usually conducted using the theory of welfare economics, where the total consumer's surplus, which is defined as the aggregate willingness to pay (or individual utility indicator), is maximized. In this report, however, the analysis will be focused on the maximization of national income instead of the consumer's surplus, in accordance with the procedure which is usually followed by international financial organizations such as the World Bank.

An economic benefit of the development project concerned from the national economic point of view is the acquisition of foreign currencies by exporting lead and zinc concentrates. The economic cost of the project, on the other hand, which is called "opportunity cost", represents, a decrease in national income and thus a loss to the Peruvian national economy, as a result of capital and labor input to the project. In this report, economic benefits (on an FOB basis in dollars) are equivalent to financial benefits (see above) because financial evaluation is made in US dollars. Economic cost (opportunity cost), however, differs from financial cost for the following reasons.

The first reason is tax. Tax imposes a cost on companies, while it is a source of revenue or a benefit on the side of the government. However, from the national economic point of view, including both companies and the government, costs and benefits cancel each other out, and therefore the opportunity cost or economic cost related to taxes and any similar payment to government agencies must be assessed at zero.

The second reason is wages. In Peru, mining workers are paid considerably more than the general standard. However, if the development project is not realized, the workers, who, are supposed to be engaged in the project, (except for the skilled staff) will be paid much less. This is so because the opportunity cost (or economic cost) of the labor force involved in the project must be much lower than the wages calculated in the assessment of financial cost, in consideration of the fact that wages for general work are usually fixed at a level related to the value of the marginal product of labor.

The third reason relates to costs assessed on a sol basis but converted into dollars, or in other words, exchange rate consideration. The sol was converted into the dollar at the official exchange rate in assessing financial cost. From the national economic point of view, however, can the people freely purchase US dollars by converting soles at the official exchange rate? If they can, there will be no balance of payments problem in the Peruvian economy; even if trade is liberalized, neither will there be a parallel foreign exchange market where a financial rate other than the official exchange rate is applied. Limited data make it difficult to estimate opportunity cost of soles in dollars (or shadow exchange rate) accurately, but when converting it is necessary to apply the financial exchange rate, if not even lower rates.

In economic evaluation in this report, taxes as a part of financial cost, wages payed to workers except for skilled staff, and costs in soles, were adjusted in order to assess economic costs, for the above-mentioned reasons. The economic internal rate of return was calculated by using the DCF formula and the economic costs and benefits (which are equal to financial benefits) which were assessed as mentioned above for each year of the project life.

1.2 THE FINANCIAL INTERNAL RATE OF RETURN

1.2.1 Summary

The Iscaycruz mine development under the Peruvian General Mining Law will be carried out by a Special Mining Company whose capital is shared among the Peruvian government agency having a concession for Iscaycruz, a foreign private company and Peruvian private capital.

Accordingly, on the assumption that about a quarter of the investment in the development will be covered by capital, and the remainder will be borrowed over a long term, the annual expenditures, income, and cash flow were assessed, and the financial internal rate of return was evaluated for both the entire investment and for capital.

In the expenditure and income accounting, all preferential treatment and incentives provided by the General Mining Law and the Tax Law applicable to Peruvian mines as of October, 1985 were taken into consideration.

1.2.2 Assumptions for Calculation

(1) Annual Amount of Concentrates (For details, see 6.1 Production Plan, Section 6, Chapter 2.):

Pb-concentrate 4,458 t (Grade: Ag 265 g/t, Pb 65%)
Zn-concentrate 60,618 t (" : Zn 52%)

(2) Mine Life : 10 years

(3) Inflow (Income) : All the produced concentrates shall be exported under the following terms and conditions:

· Selling conditions

Concentrate	Price	Condition
Pb	Ag: ¢700/oz Pb: ¢25/lb	95% or less 50 g, Price x99% 95% or less 3 units T/C: $150/t (Base ¢22/lb-Pb) R/C Scale: +$3/¢
Zn	Ag: ¢700/oz Zn: $900/t	3 oz less x 80% less 8 units or 85% T/C: $150/t (Base $850/t-Zn) R/C Scale: ±$3/¢

· Handling loss	1.5% (Inland 1.0%, Ocean 0.5%)
· Moisture in concentrate	7.0%
· Ocean freight	$35/wt (from Callao Port to a Japanese port)
· Marine insurance	FOB x 0.2695%

(4) Costs (Expenditures)

- Direct and indirect operation costs (For details, see 6.3, Section 6, Chapter 2)

Annual direct operation cost	$5,205,000
Annual indirect operation cost	$2,111,000

- Depreciation
  Each of the initial and additional investments and replacement costs shall be depreciated at a maximum rate of 20% per year.
  (For details of the initial and additional investments and replacement costs, see 6.3, Section 6, Chapter 2).

- Interest
  The part of the initial investment not supplied by capital shall be procured through long-term borrowing in consideration of the expenditures during the development period. The working capital for the first year of production (30% of the total cost less depreciation and interest) and annual financial shortfall shall be covered by short-term borrowing.
  Interest accruing during the development period shall be combined with the principal and repaid at the end of the year at a fixed rate for ten years. Annual interest is estimated at 9% (compound interest) including interest tax.

(5) Deductions

- Contribution to the Mining Community: 10% of the profit before deduction
- Contribution to INGEMMET: 1.5% "
- Reinvestment allowance: 40% at most
  (This is not applicable to years in which no additional investments or machine replacements are made)

(6) Income Tax

The following tariff is applicable, and the UIT (unit of taxation) is estimated to be $324.

Taxable income		Income tax rate (%)
Over	Not over	
	150 UIT	30
150 UIT	1,500 UIT	40
1,500 UIT	3,000 UIT	50
3,000 UIT		60

During the investment period and for five years thereafter, one third of the tax assessed from the tariff shall be included in the accounting, and the period of carry-over for tax losses shall be four years.

(7) Capital

The capital is expected to cover about a quarter of the initial investment and the entire cost of detailed survey, the F/S (feasibility study) and detail design. The remainder is used to cover expenditures each year during two years of development work. In the calculation, cost to raise the capital is ignored.

(-5) year (Detailed survey)	$1,889,000
(-4) " (" F/R)	$1,206,000
(-3) " (Detail design, etc.)	$ 451,000
(-2) " (Development work)	$1,000,000
(-1) " (")	$3,454,000
Total	$8,000,000

1.2.3 Summary

The income statement, the fund flow statement and the annual cash flows as shown in Table 4.1 can be summarized as follows:

Item	Amount ($1,000)	Remark
Revenue	128,819	
Direct & indirect operation costs	73,160	
Depreciation	37,061	The financial internal rate of
Interest	14,048	return (F IRR):
Profit before deductions	4,550	as against the investment:
Mining Community, INGEMMET	599	7.68%
Reinvestment allowance	-	as against the capital:
Income before tax	3,951	3.56%
Income tax	825	
Net profit	3,126	

Table 4.1 Income Statement, Fund Flow Statement and Cash Flow

($1,000)

Item	Total	Year(-5)	(-4)	(-3)	(-2)	(-1)	1	2	3	4	5	6	7	8	9	10
PRODUCTION																
Pb-concentrate (t)	44,580						4,458	4,458	4,458	4,458	4,458	4,458	4,458	4,458	4,458	4,458
Zn-concentrate (t)	606,180						60,618	60,618	60,618	60,618	60,618	60,618	60,618	60,618	60,618	60,618
INCOME STATEMENT																
(1) REVENUE																
Pb-concentrate	10,070						1,007	1,007	1,007	1,007	1,007	1,007	1,007	1,007	1,007	1,007
Zn-concentrate	142,820						14,282	14,282	14,282	14,282	14,282	14,282	14,282	14,282	14,282	14,282
Other revenue	529						0	0	0	0	0	0	0	0	0	529
Ocean freight	24,250						2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425
Insurance	350						35	35	35	35	35	35	35	35	35	35
Revenue total	128,819						12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	13,358
(2) COST																
Direct operation cost	52,050						5,205	5,205	5,205	5,205	5,205	5,205	5,205	5,205	5,205	5,205
Hauling	12,590						1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259
Ship loading, charge	4,990						499	499	499	499	499	499	499	499	499	499
Tax, commission	3,530						353	353	353	353	353	353	353	353	353	353
Subtotal	73,160						7,316	7,316	7,316	7,316	7,316	7,316	7,316	7,316	7,316	7,316
Depreciation	37,061						3,418	3,418	3,470	3,725	3,981	4,236	4,491	4,747	3,988	1,587
Interest	14,048						2,554	2,299	2,043	1,788	1,532	1,277	1,022	766	511	255
Cost total	124,269						13,289	13,033	12,829	12,829	12,829	12,829	12,829	12,829	11,815	9,158
(3) PROFIT BEFORE DEDUCTION	4,550						-460	-204	0	0	0	0	0	0	1,014	4,200
(4) DEDUCTIONS																
Mining Community	521						0	0	0	0	0	0	0	0	101	420
INGEMMET	78						0	0	0	0	0	0	0	0	15	63
Reinvestment allowance	0						0	0	0	0	0	0	0	0	0	0
(5) INCOME BEFORE TAX	3,951						-460	-204	0	0	0	0	0	0	898	3,717
(6) INCOME TAX	825						0	0	0	0	0	0	0	0	132	693
(7) NET PROFIT	3,126						-460	-204	0	0	0	0	0	0	766	3,024
FUND FLOW STATEMENT																
(1) Revenue	128,819	0	0	0	0	0	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	13,358
(2) Capital	8,000	1,889	1,206	451	1,000	3,454	0	0	0	0	0	0	0	0	0	0
(3) Loan	26,645	0	0	0	6,739	19,906	0	0	0	0	0	0	0	0	0	0
(4) In: total	163,464	1,889	1,206	451	7,739	23,360	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	13,358
(5) Operation cost (Inc. Mining Community, INGEMMET)	73,760	0	0	0	0	0	7,316	7,316	7,316	7,316	7,316	7,316	7,316	7,316	7,433	7,799
(6) Interest	14,048	0	0	0	0	0	2,554	2,299	2,043	1,788	1,532	1,277	1,022	766	511	255
(7) Income tax	825	0	0	0	0	0	0	0	0	0	0	0	0	0	132	693
(8) Investment	35,327	1,889	1,206	451	7,739	21,165	0	20	19	193	903	898	785	59	0	0
(9) *Working capital*	0	0	0	0	0	2,195	0	0	0	0	0	0	0	0	0	-2,195
(10) Repayment	28,379	0	0	0	0	0	2,838	2,838	2,838	2,838	2,838	2,838	2,838	2,838	2,838	2,838
(11) Out: total	152,339	1,889	1,206	451	7,739	23,360	12,708	12,473	12,216	12,135	12,589	12,329	11,961	10,979	10,914	9,390
(12) BALANCE	11,126	0	0	0	0	0	121	356	613	694	240	500	868	1,850	1,916	3,968
CASH FLOW (Against the investment)	18,908	-1,889	-1,206	-451	-7,739	-23,360	5,513	5,493	5,494	5,320	4,610	4,615	4,728	5,454	5,265	7,061
CASH FLOW (Against the capital)	3,126	-1,889	-1,206	-451	-1,000	-3,454	121	356	613	694	240	500	868	1,850	1,916	3,968

F. IRR (Against the investment) 7.68%
F. IRR (Against the capital) 3.56%

1.3 THE ECONOMIC INTERNAL RATE OF RETURN

As stated in the previous paragraph, financial cost estimated in financial evaluation has to be converted to opportunity cost or economic cost to evaluate the project from the national economic point of view. It has already been explained that economic benefits equal financial benefits made from the sales of concentrates at FOB prices in dollars.

1.3.1 Conditions for Estimating Economic Cost

(1) Taxes (income tax, export and import taxes, sales tax, etc.), commissions and other payment to the government are zero in terms of opportunity cost from the national economic point of view, and therefore they have a zero value in the economic cost.

(2) Labor costs (monthly) within the conomic cost shall be assessed on the basis of the results of the local survey: it is assumed that in the case of employees and workers, the minimal wages (S/.530,000 per month and S/.20,000 per day) are applied; there are on average 25 working days monthly, and that insurance premiums and other charges amounting to 80% of the minimum wage are paid by the company.

(3) The financial exchange rate of S/.17,500 to a dollar (at the time of the survey), which is available for foreign tourists and others at commercial banks, shall apply to the cost items payable in soles to obtain their economic costs expressed in dollars.

As for the costs of various construction works and unloading concentrates, typical costs shall first be estimated and then 65% of the construction cost and 50% of the transportation cost (both in terms of financial cost) shall be accorded to these respective categories when calculating economic cost. This is so, because some materials used are imported and thus paid for in dollars, and also various kinds of taxes and labor costs are included in the costs of these materials and this makes it difficult to estimate the cost break-down. For transportation element in economic cost, "Costos de Operation Vehicular" by the Peruvian Ministry of Transportation and Communications was referred to.

1.3.2 Converting Financial Cost into Economic Cost

Financial cost, consisting of the costs involved in initial investment and operation, additional investment, replacement and salvage value was converted into economic cost using the above-mentioned conditions for estimating economic cost. The results are as shown in Table 4.2, 4.3 and 4.4. As for the costs included economic cost, except for the costs of construction, machinery and goods, and personnel (Peruvian), only the conversion of the exchange rate was applied to items payable in soles, and they were estimated a little higher in terms of economic cost.

1.3.3 Result

Economic benefits and costs by year, and internal rate of return drawn from them are shown in Table 4.5. The economic cost of working capital was estimated by applying the conversion factor to the entire operational cost.

The estimated economic internal rate of return was 24.99%, which indicates the high feasibility of this project from the point of view of the Peruvian national economy. The rate indicates the profitability of the project in itself independent of government policies such as taxation, and therefore it is recommended that the Peruvian government should actively promote the project, even to the extent of giving further incentives to the mining company.

Table 4.2 Summary of Capital Cost

($1,000)

Item	(-5) Year		(-4)		(-3)		(-2)		(-1)	
	$	S/.	$	S/.	$	S/.	$	S/.	$	S/.
(FINANCIAL COST)										
(1) Construction Cost										
Detaild survey	-	1,802	-	968	-	-	-	-	-	-
Mining	-	-	-	-	-	-	-	2,675	-	2,429
Concentrator	-	-	-	-	-	-	-	572	-	979
Tailing disposal	-	-	-	-	-	-	-	124	-	1,047
Power plant	-	-	-	-	-	-	-	121	-	287
Power distribution	-	-	-	-	-	-	-	-	-	110
Communication	-	-	-	-	-	-	-	8	-	51
Water supply	-	-	-	-	-	-	-	-	-	43
Repair shop	-	-	-	-	-	-	-	55	-	-
Auxiliary facilities	-	-	-	-	-	-	-	811	-	18
Welfare facilities	-	-	-	-	-	-	-	903	-	1,942
Const.facilities	-	-	-	-	-	-	-	51	-	-
Subtotal	-	1,802	-	968	-	-	-	5,320	-	6,906
(2) Equipment Cost										
Mining	-	-	-	-	-	-	454	203	1,683	1,096
Concentrator	-	-	-	-	-	-	-	-	2,409	2,033
Tailing disposal	-	-	-	-	-	-	-	-	-	70
Power plant	-	-	-	-	-	-	-	-	2,321	1,040
Power distribution	-	-	-	-	-	-	-	-	329	314
Communication	-	-	-	-	-	-	-	12	77	35
Water supply	-	-	-	-	-	-	-	-	178	96
Repair shop	-	-	-	-	-	-	133	59	-	-
Auxiliary facilities	-	-	-	-	-	-	96	140	145	65
Lima head office	-	-	-	-	-	-	-	49	-	-
Const. facilities	-	-	-	-	-	-	-	48	-	-
Const.management	-	-	-	-	-	-	-	140	-	143
Lima head office	-	-	-	-	-	-	-	16	-	24
Inventory	-	-	-	-	-	-	-	-	21	91
Subtotal	-	-	-	-	-	-	683	667	7,163	5,007
(3) Labor Cost										
Staff	-	-	-	-	-	-	-	84	-	114
Employee	-	-	-	-	-	-	-	19	-	41
Worker	-	-	-	-	-	-	-	19	-	36
Subtotal	-	-	-	-	-	-	-	122	-	191
(4) Others	12	75	163	75	451	-	441	628	982	1,107
Total	1,889		1,206		451		7,739		21,165	
(ECONOMIC COST)										
Construction cost	1,171		629		-		3,458		4,489	
Equipment Cost	-		-		-		962		8,683	
Labor Cost	-		-		-		79		115	
Others	72		223		451		943		1,868	
Total	1,243		852		451		5,442		15,155	

Table 4.3 Summary of Operation Cost

($1,000)

	Item	$	S/.	Total
Financial Cost	Labor cost			
	Staff	-	192.0	
	Employee	-	170.4	
	Worker	-	556.2	
	Subtotal	-	918.6	
	Material cost	518.6	1,626.9	
	Conc. hauling	-	1,259.5	
	Ship loading	-	498.7	
	Tax, commission	-	352.8	
	Others	208.8	1,932.3	
	Total			7,316.2
Economic Cost				
	Labor cost			390.7
	Material cost			1,536.9
	Conc. hauling			630.0
	Tax. commission			0
	Others			2,153.6
	Total			4,711.2

Table 4.4 Summary of Additional Investment and Replacement Cost

($1,000)

	Item	2 yr	3	4	5	6	7	8	Total
Financial Cost	Additional investment	-	-	-	150	150	175	-	-
	Replace. cost	20	19	193	753	748	610	59	-
	Total	20	19	193	903	898	785	59	-
	Residual value	-	-	-	-	-	-	-	529
Economic Cost	Additional Investment	-	-	-	98	98	114	-	-
	Replace. cost	14	14	139	542	539	439	42	-
	Total	14	14	139	640	637	553	42	-
	Residual value	-	-	-	-	-	-	-	388

Table 4.5 Annual Economic Benefits and Costs and Economic Internal Rate of Return

($1,000)

Item	-5年度	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Economic Benefits															
Income	-	-	-	-	-	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829
Residual value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	388
Total	-	-	-	-	-	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	12,829	13,217
Economic Costs															
Capital cost	1,243	852	451	5,442	15,155	-	-	-	-	-	-	-	-	-	-
Operation cost	-	-	-	-	-	4,711	4,711	4,711	4,711	4,711	4,711	4,711	4,711	4,711	4,711
Working capital	-	-	-	-	1,229	-	-	-	-	-	-	-	-	-	-1,229
Add., Replace.	-	-	-	-	-	-	14	14	139	640	637	553	42	-	-
Total	1,243	852	451	5,442	16,384	4,711	4,725	4,725	4,850	5,351	5,348	5,264	4,753	4,711	3,482
Net Economic Benefits	-1,243	-852	-451	-5,442	-16,384	8,118	8,104	8,104	7,979	7,478	7,481	7,565	8,076	8,118	9,735

E. IRR = 24.99%

1.4 SENSITIVITY ANALYSIS

The estimate of the annual profit (loss) and cash flow has been calculated under the consideration of a certain term and condition which are influenced on calculation. However, value of this balance estimation will be varied correspondingly with the terms and conditions to be assumed.

We indicate the economic internal rate of return is as high as 24.99% according to the financial and economic evaluation, although the financial internal rate of return for the entire investment shows at 7.68%. This means that the investment in this project is feasible from the Peruvian national economic point of view and this project is promissible on the economical evaluation.

To be improved the financial internal rate of return would be necessary either to increase the income (such as rising of the metal price, upgrading of concentrates, higher metal recovery and expansion of production and so on.) or to reduce the expenditure (such as investment cost and operation cost and etc.).

Although, there are various factors to be effected on profitability and to be considered together with the combination of them but they will not be easily identified or clarified in terms of their nature and alternatives at the present stage, sensitivity analysis was made under the following assumptions.

(1) Case of reducing the investment cost on the machinery and equipment by the way to be shifted them from the suspended domestic mines.
Assuming the machinery and equipment for mining, concentrator and diesel power plant are available in Peru and they will be purchased with an amount of 50% of the brand new prices including the dismantling, transportation and overhaul costs and as a result $5,500,000 of investment requirement (equivalent to 43% of the purchasing cost on the machinery and equipment) are saved, 7.68% of the financial internal rate of return will be rised to about 9.9%.

(2) Case of increasing the income by upgrading of Zn-concentrate at the sacrifice of Zn recovery.
While 93% of the annual revenue will be born from the income of the Zn-concentrate, more higher Zn-concentrate price at FOB value will be obtained with rising the Zn grade at the sacrifice of Zn recovery and other hand, elimination of the inland transportation and the ocean freight costs will be compensated more than the lost value due to less volume of the concentrate.
Whenever Zn recovery of 85% (lowered by 3% than plan) and Zn grade of 55% (raised by 3% than plan) are maintained, the financial internal rate of return would rise to about 8.7%.

(3) Case of execmption from the import tariffs on machinery and equipment.
Supposed that the import tariffs on the machinery and equipment will be exempted and the price of them will be expected at an amount of 1.2 times of FOB price (foreign ports), the financial internal rate of return would rise to about 8.9%.

2. EFFECTS ON THE LOCAL COMMUNITIES

The exploitation of ore deposits at Iscaycruz may have various effects on neighboring communities. These effects, excluding for the moment macro-economic effects, may be classified into the following four categories:

(1) Effects by newly generated income
(2) Effects by improvements in infrastructure
(3) Effects by increases in population
(4) Effects on the natural environment by productive activities

Of these categories, (1) may be the most significant. As for improvements in infrastructure, there will be some road improvement works involved; for example, the improvement of the section between Oyon and Mishuya, repair works done between Mishuya and the mine to be developed, and emergency repair of damaged stretches of National Road No. 16 between Sayan and Churin. Of these improvements, the repair of the national road is the most important for this area; however, the development of the Iscaycruz mine may not contribute much with this respect, because the Ministry of Transportation and Communication, Raura Mine, and Uchuc Chacua Mine have already taken responsibility for its repair and maintenance.
Therefore, in the following paragraphs, we will largely focus on effects by newly generated income. For convenience's sake, (1) and (2) are considered to be economic effects whereas (3) and (4) to be social effects. Neighboring areas of Iscaycruz are divided into two levels: one is called the "immediate zone", representing principally the communities of Oyon, Pachangara and Churin, which will presumably be influenced directly by the mine development; and the other is a wider area along National Road No. 16 between Huacho and Ambo, chosen from a broader viewpoint. These zones are shown in Fig. 4.1.

2.1 THE CURRENT STATE OF THE IMMEDIATE ZONE

The immediate zone consists of the Oyon and Pachangara districts (the largest town in the latter, Churin), formerly part of Cajatambo Province, Lima Department; however, in October, 1985, they, along with several other districts in the basin of the Huaura River, separated from Cajatambo Province to form Oyon Province.
Cajatambo Province, before the separation, is divided into eleven districts; Oyon district ranks first in population, and Pachangara third. These districts together constitute the center of population along the upper reaches of the Huaura River.

2.1.1 Population and labor force

Data on general and working population taken from the census in 1981 are shown in Tables 4.6, 4.7 and 4.8. According to local officials there has been no major change in population since then.
In Cajatambo Province, located in the northeast part of Lima Department and in the western part of Andes Mountains, agriculture has not been highly developed because of unfavorable natural conditions such as steep land and severe alpine climate. This fact is reflected in the composition of the population; that is, the urban (and small community) population represents a relatively large proportion (about 52%), and the agricultural population is relatively small (about 35% of the working population over 15 years of age). This tendency is even more marked in Oyon and Pachangara Districts.

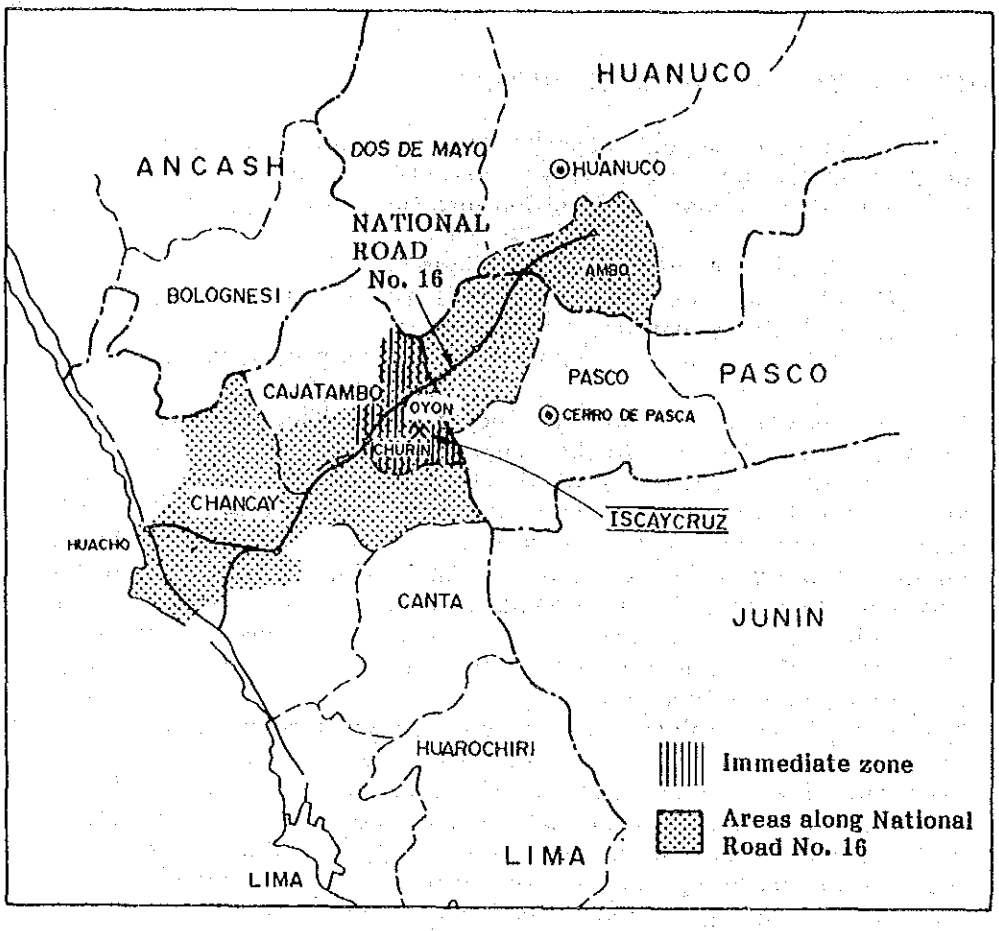


Fig. 4.1 Affected Areas

The unemployment figure for men over 15 years of age (for which data are not available) can be estimated from the results of a local survey to be at almost the same level as the figure for males between 6 and 15 years of age, that is, about 3.0%. According to an official from Oyon Community, there are about 100 people in the age range 18 to 40 seeking work in the district.

Table 4.6 Population

	Total	Urban	Rural
Oyon	8,354	6,304	2,050
Pachangara	3,339	1,766	1,573
Subtotal	11,693	8,070	3,623
Cajatambo province	28,555	14,417	14,138

Table 4.7 Working Population, 15 years and older; Cajatambo Province

	Total	Male	Female	Laborer	Office worker	Self employed	Domestic worker	Other
Agriculture	4,927	4,153	774	322	27	4,014	490	74
Mining	1,120	1,073	47	944	154	10	6	6
Manufacturing	245	214	31	73	15	142	8	7
Other	8,473	6,808	1,665	1,830	680	4,795	697	471
Total	14,765	12,248	2,517	3,169	876	8,961	1,201	558

Table 4.8 Working Population, 6-15 years

	Total	Male	Female	Employed	Unemployed
Oyon	2,449	2,010	439	2,304	145
Pachangara	1,022	798	224	1,003	19
Subtotal	3,471	2,808	663	3,307	164
Cajatambo province	8,640	6,916	1,724	8,378	262

2.1.2 Industry

Agriculture: Subsistence farming using traditional techniques is the principal type of agriculture, producing only a very small surplus for sale. The area under cultivation per farm is extremely small, usually less than 0.5 ha, and an area of 1.0 ha is regarded as rather large. Machinery has hardly been introduced, and fertilization depends mainly on animal compost, with a very small-scale utilization of chemical fertilizers. Potato is the main crop, with other produce such as barley, maize, olluco (a kind of potato) and wheat also being harvested. On the basis of the results of the local survey, the production of the main crops in the area concerned is estimated as shown in Table 4.9.

Table 4.9 Annual Production of Selected Farm Produce

	Potato	Olluco	Barley	Maiz	Wheat	Fruit	Other
Quantity (kg)							
Oyon	30,000	1,800	2,000	600	800	-	3,000
Pachangara	15,000	1,000	1,500	500	800	1,000	2,000
Total	45,000	2,800	3,500	1,100	1,600	1,000	5,000
Price (s/./kg)	2,000	2,000	2,000	3,000	3,000	2,000	2,000
Sales (s/. million)	90.0	5.6	7.0	3.3	4.8	2.0	10.0

Estimated Total Sales, s/. 122.7 million ($8,800)

Note: Excluding domestic consumption

Livestock farming: Mainly cattle, sheep and pigs are raised, but farms are small scale, under-utilizing natural grassland. The annual livestock production is estimated from the results of the local survey as shown in Table 4.10.

Table 4.10 Annual Production of Livestock

	Cattle	Sheep	Goat	Swine	Horse	Other
Quantity (head)						
Oyon	400	300	200	150	100	200
Pachangara	500	450	150	100	100	180
Total	900	750	350	350	200	380
Price (s/. 1,000/head)	3,000	750	600	500	1,000	800
Sales (s/. million)	2,700	563	210	125	200	304

Estimated Total Sales s/. 4,102 million ($293,000)

Note: Excluding domestic consumption

Forestry: The plantation of eucalyptus is carried out on a small scale over a limited area. In Oyon, the forestry cooperative manages a forest of about 6,000 trees, and sells timber mainly to the neighboring metal and coal mines for use as mine props.

Mining: This is the largest modern industry in the area concerned, and Raura Mine (Cu, Pb and Zn; production 1800 t/day; owned by Raura Mining S.A.) and Uchuc Chacua Mine (Ag; production 1000 t/day; owned by Buenaventura Mining S.A.) are in operation to the north and northwest of Oyon, respectively. These two mines employ about 950 workers and 500 workers respectively, who live with their families in their own self-contained mining camps. Thus, they have little linkage to the Oyon Area.

In addition to these mines, there are several coal mines, mainly in Mishuya in Oyon District. Although their production scale is small, they provide an important source of income.

Manufacturing: The region supports no manufacturing or processing except production of dairy products such as butter and cheese on a small scale. Most of the products are locally consumed, but some are distributed to Lima and Huacho.

Commerce: Commercial activities mainly serve the local residents. Clothes, utensils, canned food and so on are supplied mainly from Lima or Huacho. In Churin, there are some souvenir shops for tourists.

Tourism: Churin has busy spas, attracting tourists mostly from Lima. As for accommodation, there are one hotel, thirteen hostels (smaller hotels), and eight tourist homes, which together can accommodate about 550 persons in total.

Infrastructure: Individual sectors such as roads, electric power, water and communications are described in Chapter 3 "Infrastructure". In general, infrastructure in this area has made little improvement, remaining inadequate in many respects.
The current situation of educational and medical facilities is as shown in Table 4.11 based on the local survey. Both Raura and Uchuc Chacua Mines have their own schools and clinics managed by the companies.

Table 4.11 School and Clinic

	Primary and Secondary school		Clinic			
	Student	Teacher	Number	Doctor	Assistant	Accommodation
Churin	800	30	1	2	3	4
Oyon	1,000	40	1	1	3	10

2.2 ECONOMIC EFFECTS ON THE IMMEDIATE ZONE

2.2.1 The estimation of newly generated income

Labor income: Developing Iscaycruz Mine will create about 400 jobs in total, and some contract laborers may presumably be needed. The resulting annual income is estimated at about $1,080,000 in total.

This income, however, does not necessarily represent gains to the local economy. This is so because, in general, income paid for locally recruited clerks and laborers does not constitute net gain to the local economy; it only shifted its source within the same economy.

In fact, however, a considerable part of the income newly generated by the mine can be expected to add to the total income of the area, since local unemployed and underemployed people may find new employment, and since the wage level at the mine is about three times higher than local average. Assuming that ten employees and one hundred laborers will be recruited from the local area at wages three times higher than usual, and that all the contract laborers will be recruited from among currently unemployed people, net increase in income is estimated at about $1,010,000 (about 94% of the total actually paid). The breakdown is given in Table 4.12.

Table 4.12 Generated Annual Income and Net Increase (estimated)

Occupation	Generated Annual Income			Net Increase ($)	Remark
	Number	Monthly salary ($)	Annual income ($)		
Mine manager	1	2,000	24,000	24,000	
Ass. Mine manager	1	1,000	12,000	12,000	
Staff	28	500	168,000	168,000	
Employee	66	200	158,400	150,600	10 locally recuited
Worker	304	150	547,200	486,000	100 locally recruited
Subtotal	400		909,600	840,600	
Expatriate	3	4,100	147,600	147,600	
Contractor	15	100	18,000	18,000	Formerly unemployed
Total			1,075,200	1,006,200	

Capital income: Since most of the capital goods (including intermediate goods) necessary for mining operation will probably be supplied from outside areas such as Lima, the mine development will have little effect of this sort on the immediate zone. Mine props can be supplied locally, however, and the annual income from this source is estimated at about US$30,000 as shown in Table 4.13. The transportation of concentrates from the mine to Callao Port will be contracted out to outside trucking companies, having little effect on the local area. The annual expenses for concentrate transportation are estimated at US$1,260,000.

Table 4.13 Annual Demand for Mine Timber

	Volume (m^3)	Price ($/$m^3$)	Sales ($)
Log (Eucalyptus)	100	90	9,000
Board (Eucalyptus)	115	183	21,000
Total	215		30,000

2.2.2 The estimation of new demand

The incomes estimated in the previous paragraphs do not necessarily mean new gains for the residents in Oyon and Churin districts. The scale of economic effects on the immediate zone depends on what proportion of the labor and capital incomes newly generated by the Iscaycruz mine is spent on goods and services produced in Oyon and Churin districts.
To assess this proportion, we first estimate increases in demand due to the mine development for several major items produced and available in the local area.

Increases in demand for various goods can generally be calculated by the following formula:

$$D = ap + (a - a')p'$$

where

- D ; the increase in demand
- a ; the annual consumption per capita of the population of the new mine
- a' ; the annual consumption per capita in the local area
- p ; the number of mine workers brought in from outside the local area
- p' ; the number of mine workers recruited from inside the local area

That is, net new demand created by the mine is the sum of (1) the entire amount of consumption by workers brought in from outside and (2) the increase in consumption, caused by a higher per-capita consumption level due to higher wages, by workers recruited from inside the local area. On the same assumptions about recruitment as in the previous subsection, the following figures are obtained for p and p':

The number of mine workers brought in from outside	P = 1,057
The number of mine workers recruited from inside the local area	P' = 418
Total population of the mine	1,475

Agricultural products: As already mentioned, agricultural products supplied from the neighboring communities are limited in kind and quantity. As an example, using available data on potato and fresh maize, new demands are estimated as shown in Table 4.14, on the assumption that the annual average consumption per capita in the whole of Peru is applicable to the mine population and the population of the local area.

Table 4.14 Estimated Net Demand Increase for Selected Produce

	National per capita Consumption (kg/year)	Net demand Increase (ton)
Potato	83.5	88.3
Maiz	11.0	11.6

Notes; National total consumption is assumed to be equal to national total production. Potato; 1979-84 average; Maiz; 1982-83 average.

Sources; Institute Nacional de Estadistica, Peru; Compendio Estadistico 1984.
Ministerio de Agricultural, Boletin Estadistico de la Produccion Agricola 1983.

Livestock products: Beef, pork, poultry and egg will be considered under this heading. The annual average per capita consumptions of these products in Peru are 5.4 kg, 3.1 kg, 10.5 kg, and 3.5 kg, respectively. There are, however, two problems in using these figures as the consumption levels of the mine population. One is that these statistics, which do not include imports, are lower than actual levels; the other is that meat consumption by the mine population is expected to be greater than the national average, because their wage and salary levels are set higher than the national average.
In the Lima metropolitan area, the annual average per capita consumptions of beef, pork and poultry including imports are 8.5 kg, 3.1 kg, and 18.0 kg, respectively. In the light of these figures, the annual demand among mine workers for these items is estimated as shown in Table 4.15, on the assumption that the consumption in the local area is the same as the national average, while it is 50% higher among the mine population.

Table 4.15 Estimated Net Demand Increase for Meat and Poultry

	Annual per Capita Consumption				Net demand increase (ton)
	National average*1) (kg)	Lima*2) (kg)	Mine camp (kg)	Local (kg)	
Beef	5.4	8.3	8.1	5.4	9.7
Pork	3.1	3.1	4.7	3.1	5.6
Chicken	10.5	18.0	15.8	10.5	18.9
Egg	3.5	-	5.3	3.5	6.4

Notes; *1) 1981-84 averages.
*2) 1973-82 averages.

Sources; Institute Nacional de Estadistica, Peru: Compendio Estadistico 1984.
Ministerio de Agricultura, Boletin Estadistico de la Produccion Pecuria Peru: 1982.

Forest products: Mine timber can be supplied locally. The quantity and value of its demand are shown in Table 4.13 above.

Manufactured products: In the local area, only very small amounts of dairy products are produced. Although it is probable that milk, butter and cheese may be supplied to the mining camp, the demand cannot be estimated because production figures are not available.

Services: Since it is expected that the mine development will be followed by an influx of more than 1,000 people to the local area, and by an annual increase of about $1 million in net income, there must be a considerable potential demand for services. Demand for daily goods and clothes, and for the restaurant business will be met in Oyon and Churin Districts to a considerable extent, although new demand for retail foodstuffs is expected to be small, because they will mostly be supplied by a store run by the mine company at the mining camp.
It is difficult to quantify the service activities, but the annual new demands for services are estimated as shown in Table 4.16, on the assumption that the retail margin of commodity sales (except foodstuffs) is generally 10% of household income, and that 4% of income is spent on bar and restaurant expenses.

Table 4.16 Estimated New Demand for Services

	Demand as portion of income (%)	Income	New demand
Retail	10	1,006,200	100,620
Restaurant	4		40,250
Total			140,870

Transportation: The largest demand is for the transportation of concentrates, and the annual expenditure on transportation is estimated at $1,260,000. Of all the cost items, only the labor cost is relevant to the economy of the local area. Assuming that the labor cost accounts for 10% of the transportation expenditure (based on data from the Ministry of Transportation and Communication), a new labor demand worth $126,000 will result.

2.2.3 The estimation of local supply and sales

New demands for several sectors have been estimated, but it is difficult to forecast what proportion of the estimated new demand will be met by local supply, and added to the incomes of local producers.
This is so because two uncertainties are involved in such a projection. One is a technical problem: to what extent can production be expanded to meet a considerable increase in demand. The other is a distributional one: if there is no distributive system which can secure constant supply of goods in bulk, demand at the mining camp will be directed to external areas such as Lima, passing over the local producers.

To illustrate the first problem, consider the estimated demand for potatoes, which is about twice the current production. It will also be impossible for local producers immediately to meet the total demand for poultry, which are not being raised at present. However, it is unrealistic to assume that their production will stay at the current levels in the future. To put the case of the second problem, the mining company does not need to purchase daily necessities such as foodstuffs in the local area to save transport costs, because they can be purchased in quantity in Lima and carried by the returning concentrates trucks. In fact, Uchuc Chacua Mine near Iscaycruz obtains its foodstuffs from Lima, except meat which is supplied from Churin District.

It is therefore not very useful to try to specify only one figure for each proportion of local supply, since many uncertainties are involved. Instead, it is preferable to compare several projections based on different assumptions.
The following three scenarios are assumed:

(1) 100% of the demand for each item is locally supplied.

(2) As for foodstuffs, 50% of the local production or local demand, whichever is the smaller, is locally supplied; and for items other than foodstuffs, 20% is locally supplied.

(3) The supply rate of each item is set at a reasonable level with respect to current levels of supply.

Note: It is assumed that in each case supply increase is covered by expanding production.

The local supply and sales estimated for each scenario are shown in Table 4.17. Note, however, that these figures all underestimate the real values since some items which are available from local producers are excluded and multiplier effects are not taken into account.

Table 4.17 Estimated Local Supplies and Sales

Item (Unit)	(D) Demand	Local Production	Price ($/unit)	Scenario 1			Scenario 2			Scenario 3		
				Local (S) supply	Sales ($1,000)	Local supply ratio S/D (%)	Local (S) supply	Sales ($1,000)	Local supply ratio S/D (%)	Local (S) supply	Sales ($1,000)	Local supply ratio S/D (%)
Potato (ton)	88.3	45.0	142.9	88.3	12.6	100	22.5	3.2	25	53	7.6	60
Maiz (ton)	11.6	1.1	214.3	11.6	2.5	100	0.6	0.1	5	1.7	0.4	15
Subtotal					15.1			3.3			8.0	
Cattle (head)*1)	65	900	214.3	65	13.9	100	33	7.1	50	65	13.9	100
Swine (head)*1)	111	250	35.7	111	4.0	100	56	2.0	50	111	4.0	100
Chicken (ton)	18.9	0	1,035.7*3)	18.9	19.6	100	0	0	0	1.9	2.0	10
Egg (ton)	6.4	0	585.7*3)	6.4	3.7	100	0	0	0	0.6	0.4	10
Subtotal					41.2			9.1			20.3	
Timber (m^3)	215	1,900*2)	139.5	215	30.0	100	43	6.0	20	215	30.0	100
Service ($1,000)	142.5	-		142.5	142.5	100	28.5	28.5	20	63.1	63.1	44*4)
Transport ($1,000)	125.9	-		125.9	125.9	100	25.2	25.2	20	25.2	25.2	20
Total					354.7			72.1			146.6	

Notes: *1) Converted from the figures in Table 4.15, using, 0.15 ton/head for the cattle and 0.0506 ton/head for the swine. (Source: Ministerio de Agricultura, Peru: Estadistica Basica de la Actividad Avicola y del Sector Agropeculio 1960-1985.)

*2) Converted using 0.314 m^3 per tree (length: 10 m, diameter: 20 cm).

*3) Estimated from 1984 prices in the Lima metropolitan area. (Source: Institute Nacional de Estadistica, Peru: Compendio Estadistico 1984. Consumer price indexes are from ibid p. 120 and Quarterly Economic Review of Peru, Bolivia, no. 3, 1985, Appendix 1.)

*4) Assumed local supply ratios are 30% for Retail and 80% for Bar and Restaurant.

The multiplier effect is induced by the chain-wise relation between income and consumption: part of the household income spent on goods returns to the household through wages paid by the producer, and the cycle is repeated. Since inter-industrial relationships can be ignored here, multiplier effects can be limited to the cycle of increased household income and increased consumption of agricultural and livestock products, and services. The multiplier mechanism here combines the following two components: (1) an increase in local consumers due to rising population or falling outmigration as a result of increasing employment mainly in the service sector; (2) an increase in per-capita consumption as a result of higher income.

Multiplier effects will not be considered in this study, however, because it is difficult to estimate the output elasticity of employment and the income elasticity of consumption that are needed to calculate the multipliers, and also because the scale of economic activities in the immediate zone is so small that multiplier effects as a whole may not be very large, as against the primary effects estimated in the previous paragraphs.

Table 4.18 is a summary of Table 4.17, showing the total new demand and the local supply for each scenario.

Table 4.18 Estimated Total Local Sales

Scenario	(Y) Net income Increase ($1,000)	(D) Net total New demand ($1,000)	(S) Total Local sales ($1,000)	S/Y (%)	S/D (%)
1. Optimistic			354.7	35.3	100.0
2. Pessimistic	1,006.2	354.7	72.1	7.2	20.3
3. Neutral			146.6	14.6	41.3

This table cannot, however, give any clues as to the relative magnitude of the impact of the increase in local supply upon the local economy. To see the magnitude of impact, the total production figures for the selected six items of which production data are available are compared with the current production scales in Table 4.19.

Table 4.19 Sales and Production of Six Food Items

Scenario	Six food items		(Q) Total local Agricultural production	S/P (%)	S/Q (%)
	(S) Local supply ($1,000)	(P) Local production ($1,000)			
1. Optimistic	56.3			27.0	18.7
2. Pessimistic	12.4	208.5	301.8	5.9	4.1
3. Neutral	28.3			13.6	9.4

It is possible to draw conclusions from these figures as follows:

(1) Local revenue from sales of goods will be small compared with the newly generated income. The local area in question has a poorly-structured economy to hold such income within it, and the majority of the income may drain into other areas such as Lima.

(2) Nevertheless, new demand will be relatively large compared with the current scale of the local economy. This is the case especially in the livestock sector, which may be substantially affected. The increase in demand for services, especially retail, may also be substantial.

2.2.4 Other economic effects

One of the benefits which the local area will receive from the mine development is an increase in tax revenue. This includes the property tax on the mining lot, which is, however, not very large. Large effects cannot be expected from the improvement of infrastructure, either. One possibility is the repair of National Road No. 16 when damaged, but such works have already been carried out by the Ministry of Transportation and Communication, and Raura and Uchuc Chacua Mines. Therefore, the participation of Iscaycruz Mine in such works will not give rise to further economic benefit unless the road is substantially improved.

2.3 SOCIAL EFFECTS ON THE IMMEDIATE ZONE

2.3.1 Effects of population increase

It is estimated that 1,057 people will move in to the Iscaycruz Mining Camp from outside the local area. Despite this addition to Oyon District's population of about 8400, direct influence is not expected to be very large, because the mining camp will form a self-contained community about 15 km away from Oyon, the center of the district.

2.3.2 Environmental effects

From the standpoint of the natural environment, it is the water quality of rivers in the vicinity which will be most affected by mine operation. In the downstream areas of the basin into which discharged waste water from the mine, the tailing dam and households will flow, communities are likely to suffer from pollution of drinking and irrigation water. To avoid this problem, proper measures should be taken on the part of the mining company so that sewage facilities are well designed, maintained and administered.

2.4 WIDE-RANGING EFFECTS

2.4.1 Increases in employment and income

The effects of the mine development will not be confined to the immediate zone. It is quite predictable that its economic effects will extend to the areas along National Road No. 16, outside Oyon and Pachangara Districts, and also as far as other provinces in terms of employment.
Of the mine employees, all the staffs, the majority of clerks, and about two thirds of the laborers will come from outside Oyon and Pachangara Districts. They will probably include a considerable number of formerly jobless mine workers, and therefore a substantial reduction in unemployment should occur region-wide.
Increases in production and income caused by increased consumption by the new mine population can also be expected to take place outside the immediate zone. Although most of the goods which cannot be supplied from the immediate zone will be procured in Lima, some agricultural products (mainly vegetables, fruit and poultry) are likely to be supplied from the agricultural area around Sayan along National Road No. 16. It is highly possible that an increase in consumption due to the mine population will result in the expansion of agricultural production in the above-mentioned area.

2.4.2 Improvements in infrastructure

As previously mentioned, the participation of the mine in the maintenance of National Road No. 16 by sharing the cost of restoration or by supplying machinery and labor will only bring a small benefit to the immediate zone. In the long term, however, its participation in the maintenance as a user of the road can be regarded as significant for the following reasons.

National Road No. 16 is one of the arteries across Peru from east to west. As shown in Fig. 4.2, its route extends from Huacho on the Pacific coast to Pucallpa, a center in Selvas (Forest Region) via Ambo and Huanuco. This route

is significant in two ways. One is that it will provide increased access to the Pacific coast for Yahahuanca Province, Pasco Department, and for Ambo Province, Huanuco Department, which are located on the east side of the Andes range, so that industry in these areas may be encouraged. In addition to many mines, cattle, hogs and sheep are widely raised in the areas, and access to the coast with its large population is an important factor for the producers there.

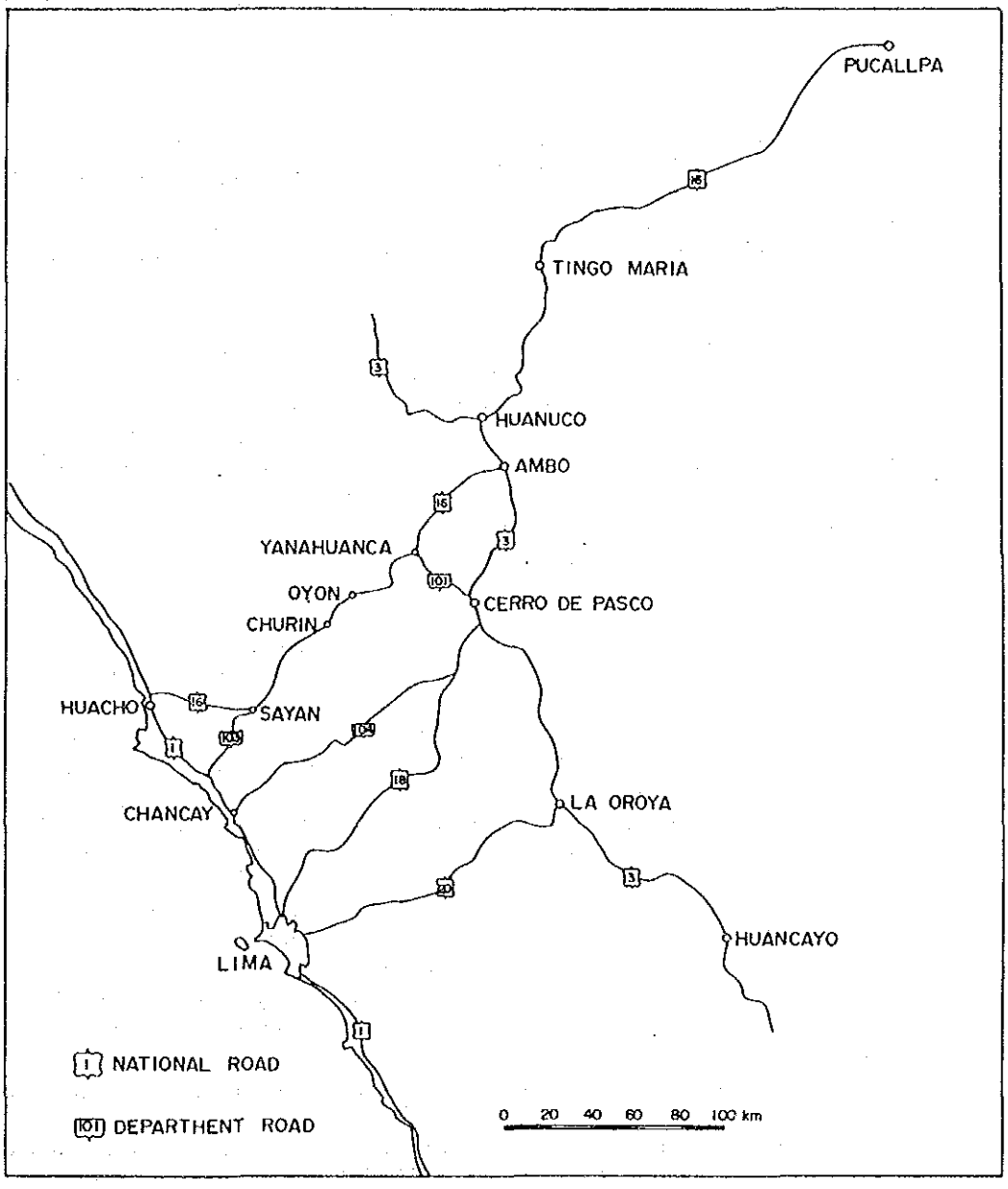


Fig. 4.2 Roads System Around Lima

The second way in which National Road No. 16 is significant is its role in developing the eastern Forest Region. The Peruvian government has given priority to the development of this region, and attaches great importance to the Lima - La Oroya - Cerro de Pasco - Huanuco - Pucallpa route as the basis for the

development. In the future, however, National Road No. 20 from Lima to La Oroya, which is the sole highway connecting the highly-populated central mountain region with Lima, is likely to become so congested as to reach its capacity limit. From the standpoint of the whole national transportation network, National Road No. 16 therefore is a valuable alternative artery for National Road No. 20.
The importance of National Road No. 16 will rise as the mountain and forest regions become increasingly developed, and so will the value of well maintaining the road, viewed from the national economy as a whole.

2.4.3 Mine development and agglomeration economies

Developing Iscaycruz Mine may also bring about agglomeration economies among the neighboring mines (both in operation and planned). The area extending from Oyon District to the border between Pasco Department and Huanuco Department to the east of the district is one of the major mining areas in Peru, and coking coal necessary for steel production is domestically produced only in Oyon District.

Developing Iscaycruz Mine in this area may give rise to various agglomeration economies. First of all, there may be a cost reduction by sharing some of the infrastructure. Currently, this is applicable only to the repair and maintenance of National Road No. 16, but electric power generation is another good area where such advantage may be exploited. Second, a greater demand for locally produced inputs may stimulate production in the surrounding areas, reducing the costs of inputs needed for mine operation.

2.5 SUMMARY

Some of the effects of the development of Iscaycruz Mine on local communities have been discussed, with the related areas divided into the immediate zone and the area along National Road No. 16.
Most economic effects in the immediate zone are attributable to the consumption of local products by the population of the mining camp and by the mining company.
According to the estimates calculated for the three scenarios, local revenue may total $355,000 per year at the most (which is an optimistic projection) or $72,000 per year at the least (a pessimistic projection). Six categories of agricultural and livestock production as a whole are expected to increase by 27% (optimistic) or 6% (pessimistic), over the current level of production. We can conclude from these estimates that the absolute value of new local income will not be very high (a large part of the newly generated income will be spent outside the local area), but that the impact will nevertheless be large compared to the current scale of the local economy.
With regard to social effects, we have focused on impact upon the natural environment, especially water quality of rivers.
From a broader viewpoint we have noted that the mine's participation in maintaining National Road No. 16 will be significant in terms of economic benefit to the national economy, and also that the mine may benefit other adjacent mines through agglomeration economies.
In conclusion, economic and social effects of developing Iscaycruz Mine on the local communities are by no means small.

CHAPTER 5 FACT FINDINGS AND RECOMMENDATIONS

CHAPTER 5 FACT FINDINGS AND RECOMMENDATIONS

1. FACT FINDINGS OF THE OVERALL EVALUATION

1.1 FEASIBILITY OF INVESTMENT

(1) The economic internal rate of return was estimated at 24.99% on the basis of the assumed metal prices (Ag: ¢700/oz, Pb: ¢25/lb, Zn: $900/t). This means that investment in this project is feasible from the Peruvian national economic point of view, according to the quoted metal prices. It is accordingly recommended that decisions be taken by the Peruvian government in favor of the mine development.

(2) In considering the economic effects of mine development on the local area including Oyon and Churin, it is expected that the local people will benefit, annually at a maximum of $355,000 and a minimum of $72,000, through increased local consumption. Although their absolute value is not very high, it can be concluded that such earnings will have a large impact on the local economy which is currently at low level. From a wider point of view, it is also expected that, in addition to increases in employment and income, a greater contribution will be made to the local and national land development schemes through participation of the Iscaycruz mine in the repairs and maintenance of National Road No. 16.

(3) However, the financial internal rate of return which was estimated at 7.68% on the entire investment basis and at 3.56% on the capital basis, is considerably lower than the assumed interest on borrowing of 9.0%. This indicates that it would be premature for the company to embark upon the project under the conditions assumed in this report (quoted metal prices, ore reserves, production scale, capital and operation, costs etc). The feasibility of the project from the point of view of the company will be dependent on changes in these assumed conditions, such as rises in quoted metal prices, increase in income due to favorable changes in production conditions, and reduced expenditure by cutting investment and direct operational costs.

1.2 POLICY RECOMMENDATIONS

(1) The large discrepancy between the financial internal rate of return and the internal economic rate of return is attributable to differences in the assessment of taxes and labor costs, as well as in foreign exchange rates; the assessment of taxes and foreign exchange rates in particular exert a major influence. For this reason, it is proposed that the Peruvian government would consider increasing tax incentives (reduction of, or exemption from, import tariffs and income tax) in favor of the project, in view of the low internal financial rate of return. If import tariffs, for example, are waived, the rate will rise to about 8.9%.

(2) Since expenses on infrastructure facilities and equipment presumably borne by the company (e.g. projected construction of hydroelectric power plant, mine roads and welfare facilities) will bring a considerable public benefit, it is recommended that the central government take measures such as overall or partial payment for these facilities.

(3) Policy support in financing is also important. Low-interest financial assistance from the government and the postponement of repayment and interest payment are proposed. However, for the company as the executor of the project, it is also required to make efforts to borrow funds at as low interest rates as possible.

It is expected that the implementation of these proposals will result in improvements in the financial feasibility of the project. The project depends to a considerable extent on whether or not fiscal (tax system) and financial policies can be flexibly managed.

1.3 TECHNICAL RECOMMENDATIONS

If the conditions assumed in the report change in the future so that the internal financial rate of return rises, the project implementing agent (the company) would be advised to:

(1) Conduct a detailed survey (drilling and tunneling) to establish the horizontal and longitudinal scale and form of Limpe deposits, their amount and quality, focused on S-adit level and above. Below S-adit level, declined drillings should be carried out, to define the ore potential of the deposits beneath. If the scale of development can be economically expanded as a result of these drillings, it can be expected that the financial feasibility of the project will be substantially improved.

(2) Investigate the possibility of using machinery and equipment now idle in non-producing domestic mines. According to the calculation made in the sensitivity analysis, it is expected that the internal financial rate of return for such a case would rise to about 9.9%.

(3) Investigate the characteristics and quality of the Ag present in theo re, because the low internal financial rate of return is due partially to the low Ag evaluation. Further study should be conducted to find a means to enhance grade, even at the expense of the concentrate recovery (especially Zn-concentrate), because the cost of transporting concentrates is high. If the recovery of Zn were lowered by 3%, and the grade of Zn in the Zn-concentrate was raised by 3%, the internal financial rate of return would rise to about 8.7%.

(4) Conduct a survey and study on the construction of hydroelectric power stations.

2. FUTURE OUTLOOK

As a result of the preliminary study on the development of the Limpe deposits (in which reserves of copper, lead, and zinc were found through an intensive survey in drilling and tunneling, it was ascertained that the development would be feasible from the national economic point of view. On the other hand, it was also made clear that prerequisite conditions had not yet been met for the start of the development from the company's point of view.

However, the project is promising for future development and therefore deserves full consideration by the government, in terms of possible improvements in fiscal

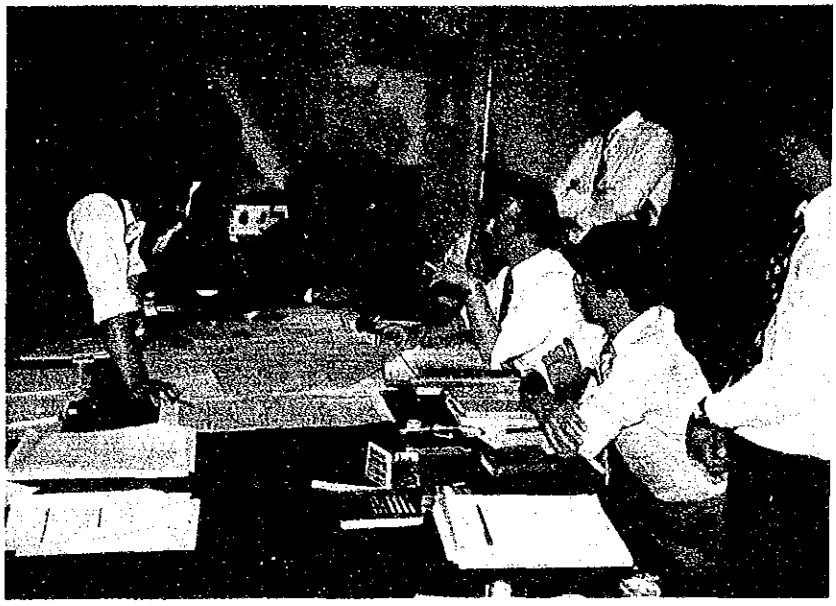
and financial conditions and implementation of a final development feasibility survey including prospecting, in order that this project may pass smoothly into the development stage.

In addition to the Limpe deposits, Limpe south deposits and Chupa deposits which have been located in Iscaycruz area are expected to contribute to the development of the local area as well as the national economy.

PHOTOGRAPH OF INVESTIGATION

(1) Courtesy call to the Minister of Energy and Mines (in MEM).
From left
Front: Fure (MMAJ), Oki, the Minister Wilfred Huaita, Yamaguchi, Inoue, Kamiki (MMAJ)
Back: Saito, Tsurumi, Nakashima

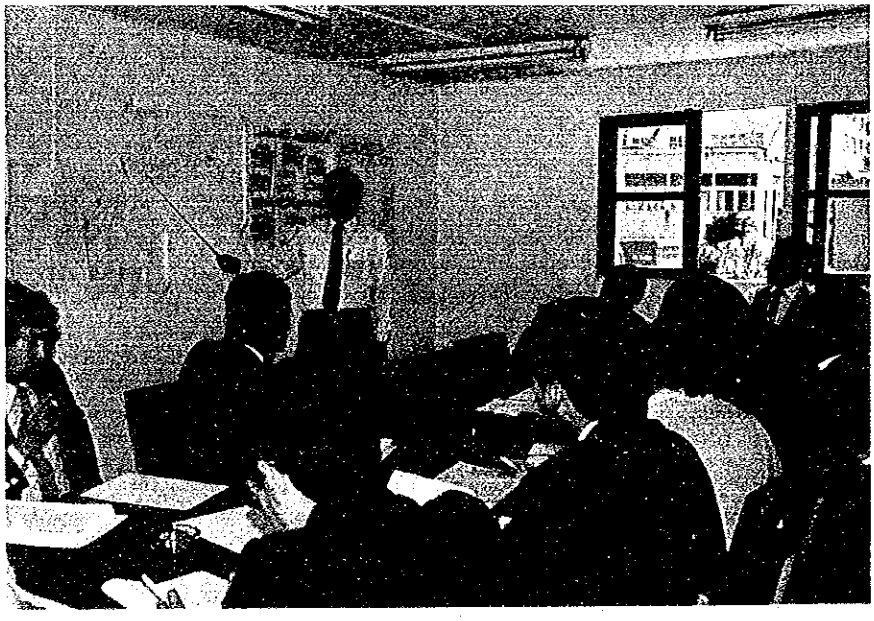
(2) Courtesy call and consultation with Director General of Mines, Sr. Luis Sanchez.



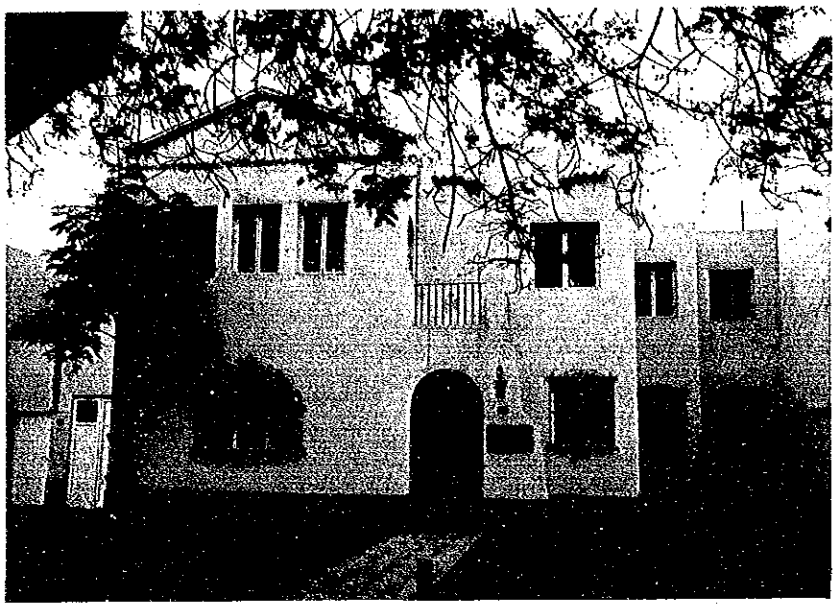
(3) Meeting with Peruvian counterpart.
(Center: Ing. Balarezo, leader of Peruvian counterpart)

(4) Meeting with staffs of INGEMMET to consult the principal plan of the survey (Oct. 10, '85).
(Center: Manager of Geological Division, Ing. Flores)

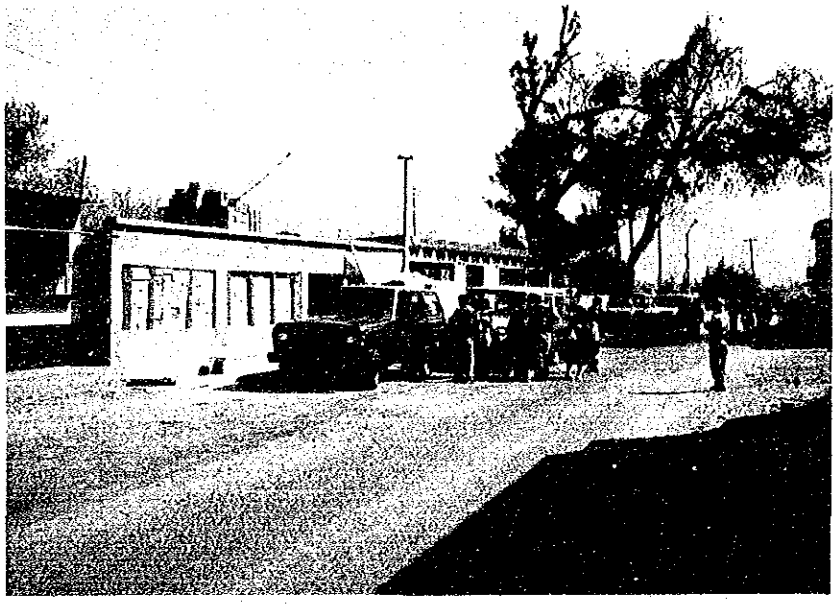
(5) Study of concentrator plan (Ing. Figueroa (left) and Ing. Oki)



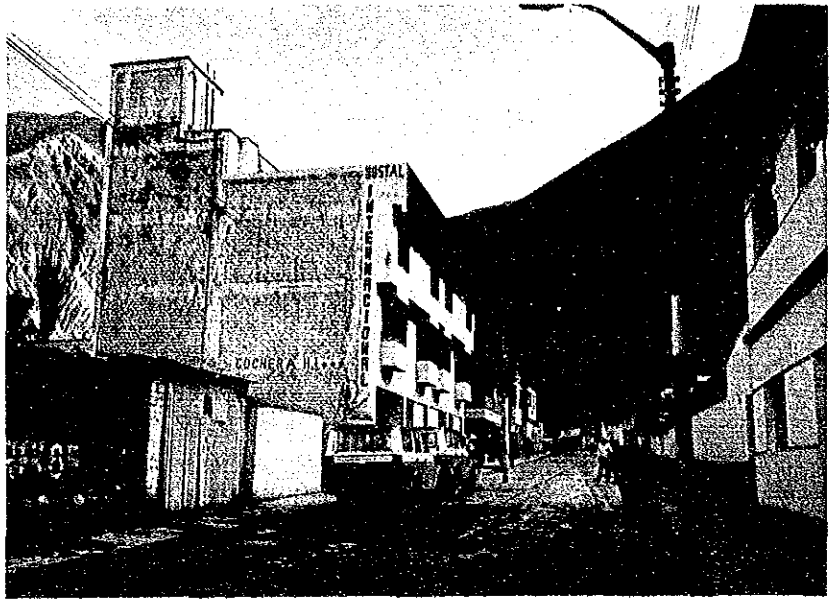
(6) Plenary meeting of MMAJ, INGEMMET and Survey Team (Nov. 7, '85)
(Right end: Executive Director of INGEMMET, Ing. Zegarra)



(7) Office for survey Team and Counterpart.

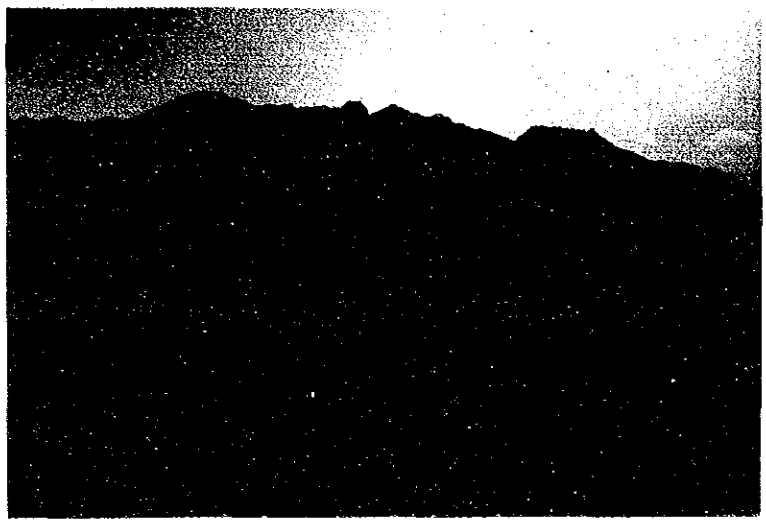


(8) Entrance of Sayan.



(9) Street of Churin.

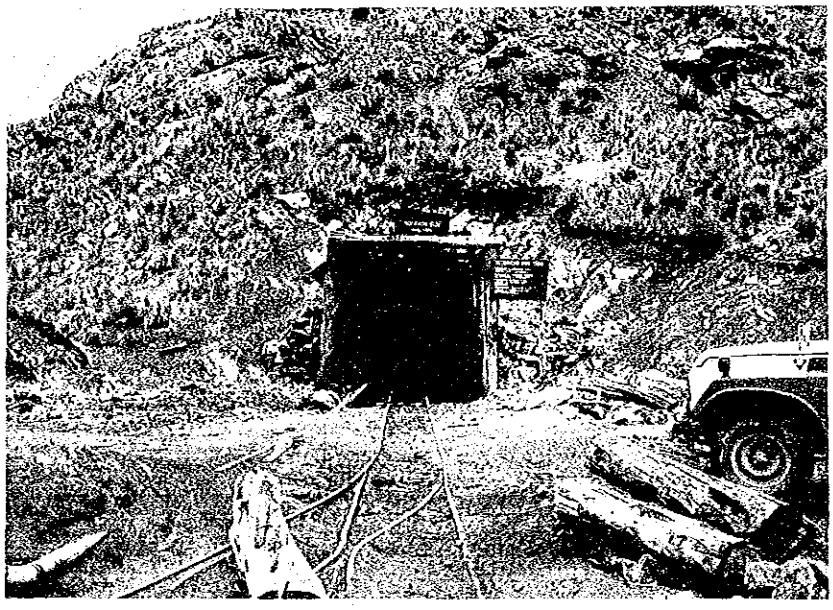
(10) Collapsed point of National Road No. 16 (12 km from Sayan).



(11) Distant view of Oyon.

(12) Road to Iscayeruz from Mishuya.

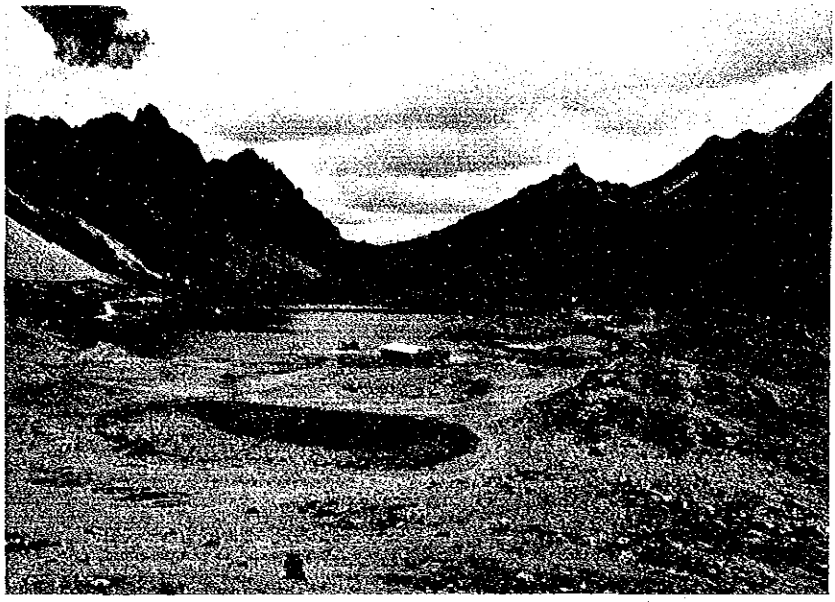
(13) Portal of N-adit (4,690 m above sea level).



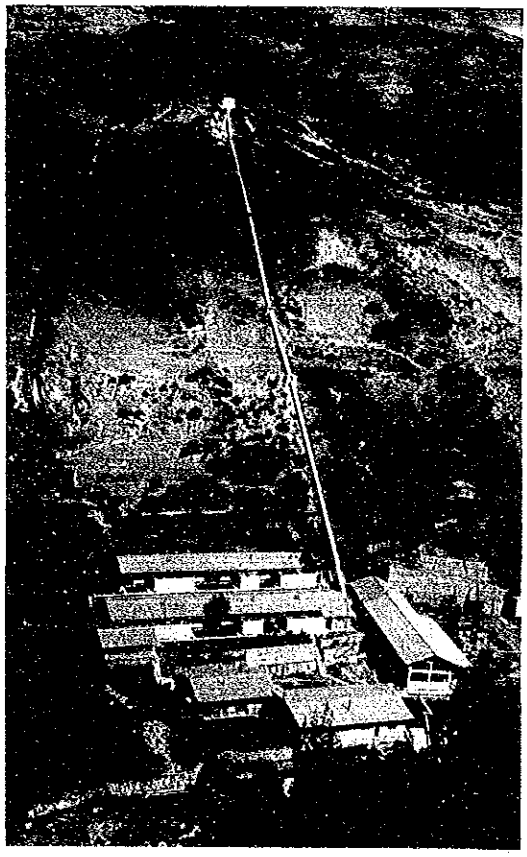
(14) Portal of S-adit (4,570 m above sea level).

(15) The expected area for productive facilities.

(16) Road in the above area.



(17) The expected area for welfare facilities.



(18) Hydroelectric power station of Raura Mine.
(1,000 kW x 4)

APPENDIX – 1

Breakdowm of Capital Cost

1. MINING

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Equipment											
	Load & haul dump	6	3.5 yd^3 class	690	690	-	230	230	-	460	460	-
	Mobile jumbo	4	50 HP class, 2 booms	380	380	-	-	-	-	380	380	-
	Leg rock drill	12	40 kg class	24	24	-	-	-	-	24	24	-
	Stoper	6	40 kg class	12	12	-	-	-	-	12	12	-
	Compressor	3	55 m^3/min. 265 kW class	306	306	-	-	-	-	306	306	-
	Main fan	1	2,200 m^3/min. 75 kW class	45	45	-	-	-	-	45	45	-
	Local fan	3	450 m^3/min. 11 kW class	6	6	-	6	6	-	-	-	-
	Trolley loco.	2	8 t	146	146	-	-	-	-	146	146	-
	Gramby car	15	5 t	135	-	135	-	-	-	135	-	135
	Pickup truck	3	110 HP class	57	-	57	-	-	-	57	-	57
	Large type jeep	3	110 HP class	30	30	-	30	30	-	-	-	-
	Bulldozer	1	21 t class	89	89	-	89	89	-	-	-	-
	Dump truck	1	15 t	134	-	134	-	-	-	134	-	134
	Hydraulic breaker	1	1,200 kg class	23	23	-	-	-	-	23	23	-
	Shovel loader	1	1.15 m^3 class	54	54	-	-	-	-	54	54	-
	Portable compressor	1	21 m^3/min. 146 kW class	37	37	-	37	37	-	-	-	-
	Other fixture	1 lot		108	92	16	19	19	-	89	73	16
	Subtotal			2,276	1,934	342	411	411	-	1,865	1,523	342
	Ocean freight etc.	1 lot		203	203		43	43		160	160	
	Import expenses	"		957		957	203		203	754		754
	Equipment total			3,436	2,137	1,299	657	454	203	2,779	1,683	1,096
(2)	Underground Work											
	Tunnel (by loader)	1 lot	2,795 m, 2.6 x 2.5 m	1,537	-	1,537	770	-	770	767	-	767
	Tunnel (by loader)	"	550 m, 3.0 x 3.0 m	330	-	330	300	-	300	30	-	30
	Tunnel (by LHD)	"	755 m, 4.0 x 3.0 m	529	-	529	350	-	350	179	-	179
	Tunnel (by LHD)	"	770 m	385	-	385	-	-	-	385	-	385
	Raise	"	490 m, 1.8 x 1.5 m	245	-	245	200	-	200	45	-	45
	Raise (by Raise borer)	"	440 m, 1.8 mφ	242	-	242	220	-	220	22	-	22
	Compressor ope.	"		439	-	439	220	-	220	219	-	219
	LHD Operation	"		294	-	294	147	-	147	147	-	147
	Supporting	"		296	-	296	148	-	148	148	-	148
	Underground total			4,297	-	4,297	2,355	-	2,355	1,942	-	1,942
(3)	Others											
	0m Level	1 lot	Rail 2,500 m, Chute 4	291	-	291	-	-	-	291	-	291
	Piping	"	Compressed air, water	57	-	57	-	-	-	57	-	57
	Installation	"	Compressor etc.	27	-	27	27	-	27	-	-	-
	Building	"	Office, Mess, Magazine etc.	386	-	386	270	-	270	116	-	116
	Transportation	"		46	-	46	23	-	23	23	-	23
	Others total			807	-	807	320	-	320	487	-	487
	MINING TOTAL			8,540	2,137	6,403	3,332	454	2,878	5,208	1,683	3,525

2. CONCENTRATOR

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Equipment											
	Apron feeder	1	40" x 12'	17	-	17	-	-	-	17	-	17
	ST Crusher	1	42" x 30"	83	83	-	-	-	-	83	83	-
	Vibrating screen	1	6' x 14', double deck	17	-	17	-	-	-	17	-	17
	Cone crusher	1	5½, Hydraulic	178	178	-	-	-	-	178	178	-
	Belt conveyor	3	24" x 20 m, 15 m, 145 m	106	-	106	-	-	-	106	-	106
	Others	1 lot	Weightometer etc.	15	15	-	-	-	-	15	15	-

2. CONCENTRATOR (Cont'd)

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
	Fine ore bin	2	Cap. 400 t, corrugate pipe	34	34	-	-	-	-	34	34	-
	Ball mill	2	9' x 12'	540	540	-	-	-	-	540	540	-
	Classifier	2	72"Φx 12', Spiral type	153	153	-	-	-	-	153	153	-
	Ball mill	1	6' x 6' Regrinding	113	-	113	-	-	-	113	-	113
	Others	1 lot	Belt feeder, cyclone etc.	29	14	15	-	-	-	29	14	15
	Conditioner	3	5'Φx 5'(1), 4' x 4'(2)	31	31	-	-	-	-	31	31	-
	Flotation cell	16	60 ft^3, Pb-roughing	97	-	97	-	-	-	97	-	97
	"	10	21 ft^3, Pb-cleaning	32	-	32	-	-	-	32	-	32
	"	36	60 ft^3, Zn-roughing	220	-	220	-	-	-	220	-	220
	"	18	38 ft^3, Zn-cleaning	79	-	79	-	-	-	79	-	79
	Blower	6	3 m^3/min.	135	135	-	-	-	-	135	135	-
	Sand pump	10	3"-2" etc.	16	16	-	-	-	-	16	16	-
	Thickener	1	20'Φx 10', Pb-concentrate	25	-	25	-	-	-	25	-	25
	"	1	33'Φx 10', Zn- "	33	-	33	-	-	-	33	-	33
	Press filter	1	17 ft^2 x 6 chambers, Pb-conc.	228	228	-	-	-	-	228	228	-
	Press filter	1	17 ft^2 x 14 chambers, Zn-con.	262	262	-	-	-	-	262	262	-
	Others	1 lot	Conveyor, weightometer etc.	41	30	11	-	-	-	41	30	11
	Thickener	1	50'Φx 10', 18'Φ Callow cone	88	5	83	-	-	-	88	5	83
	Reagent equipment	1 lot	Tank, pump etc.	7	3	4	-	-	-	7	3	4
	Mono-rail, etc.	"	5 t, 3 t	46	46	-	-	-	-	46	46	-
	Assay apparatus	"		142	40	102	-	-	-	142	40	102
	Electrical equipment	"	Switch board, Instrument	277	277	-	-	-	-	277	277	-
	Cable wire	"		90	90	-	-	-	-	90	90	-
	Subtotal			3,134	2,180	954	-	-	-	3,134	2,180	954
	Ocean freight etc.			229	229	-	-	-	-	229	229	-
	Import expenses			1,079	-	1,079	-	-	-	1,079	-	1,079
	Equipment total			4,442	2,409	2,033	-	-	-	4,442	2,409	2,033
(2)	Construction Work											
	Civil work	1 lot	Excavation, concrete work	666	-	666	466	-	466	200	-	200
	Building	"	Steel work, construction	530	-	530	106	-	106	424	-	424
	Installation	"		355	-	355	-	-	-	355	-	355
	Const. work total			1,551	-	1,551	572	-	572	979	-	979
	CONCENTRATOR TOTAL			5,993	2,409	3,584	572	-	572	5,421	2,409	3,012

3. TAILING DISPOSAL (TAILING POND)

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Preparation Work											
	Office, apparatus	1 lot		23	-	23	23	-	23	-	-	-
	Vehicles	"		25	-	25	25	-	25	-	-	-
	Temporary road	"	2,000 m	54	-	54	54	-	54	-	-	-
	Miscellaneous	"		22	-	22	22	-	22	-	-	-
	Pre. work total			124	-	124	124	-	124	-	-	-
(2)	Civil work											
	Heel dam	1 lot	Excavation 22,300 m^3, Banking 43,600 m^3	705	-	705	-	-	-	705	-	705
	Cut-off	"	18,000 m^3	47	-	47	-	-	-	47	-	47
	Under curvert	"	800 mmΦx 480 m, Decant Tower 22	212	-	212	-	-	-	212	-	212
	Under drain	"	220 m	83	-	83	-	-	-	83	-	83
	Civil work total			1,047		1,047				1,047		1,047
(3)	Cyclone, pipe etc.	1 lot		70	-	70	-	-	-	70	-	70
	TAILING POND TOTAL			1,241	-	1,241	124	-	124	1,117	-	1,117

4. POWER PLANT

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Equipment											
	Generator unit	5	820 kW, 1,200 rpm, 2,200 V, 60 V	1,970	1,970	-	-	-	-	1,970	1,970	-
	Board, pannel	1 lot	Direct current	27	27	-	-	-	-	27	27	-
	Overhead crane	"		27	27	-	-	-	-	27	27	-
	Electrical equipment	"	Cable, wire etc.	54	54	-	-	-	-	54	54	-
	Mechanical equipment	"	Steel product; pipe etc.	49	49	-	-	-	-	49	49	-
	Subtotal			2,100	2,100	-	-	-	-	2,100	2,100	-
	Ocean freight etc.	1 lot		221	221	-	-	-	-	221	221	-
	Import expenses	"		1,040		1,040	-	-	-	1,040		1,040
	Equipment total			3,361	2,321	1,040	-	-	-	3,361	2,321	1,040
(2)	Installation Work											
	Civil, building	1 lot		203	-	203	121	-	121	82	-	82
	Installation	"	Generator unit etc.	134	-	134	-	-	-	134	-	134
	Electrical work	"		59	-	59	-	-	-	59	-	59
	S/V expenses	"		12	-	12	-	-	-	12	-	12
	Inst. work total			408	-	403	121	-	121	287	-	287
	POWER PLANT TOTAL			3,769	2,321	1,448	121	-	121	3,648	2,321	1,327

5. POWER DISTRIBUTION

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Equipment											
	Main substation	1 lot	*Transformer, VCB etc.*	118	116	-	-	-	-	116	116	-
	Dist. facilities	"	Supporter etc.	130	130	-	-	-	-	130	130	-
	"	"	Cable, wire etc. (power)	52	52	-	-	-	-	52	52	-
	"	"	Wire (lighting) etc.	22	-	22	-	-	-	22	-	22
	Installation material	"		34	-	34	-	-	-	34	-	34
	Subtotal			354	298	56	-	-	-	354	298	56
	Ocean freight etc.	1 lot		31	31	-	-	-	-	31	31	-
	Import expenses	"		148	-	148	-	-	-	148	-	148
	Equipment total			533	329	204	-	-	-	533	329	204
(2)	Installation Work											
	Civil work	1 lot		64	-	64	-	-	-	64	-	64
	Distribution work	"	Main substation - substations	23	-	23	-	-	-	23	-	23
	"	"	Lighting	23	-	23	-	-	-	23	-	23
	Inst. work total			110	-	110	-	-	-	110	-	110
	POWER DISTRIBUTION TOTAL			643	329	314	-	-	-	643	329	314

6. COMMUNICATION

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Equipment											
	Radio equipment	1 lot	150 - 400 MHz	12	-	12	12	-	12	-	-	-
	Wire telephone	"	Switch board, telephone	18	18	-	-	-	-	18	18	-
	Cable, wire etc.	"		52	52	-	-	-	-	52	52	-
	Subtotal			82	70	12	12	-	12	70	70	-
	Ocean freight etc.	1 lot		7	7	-	-	-	-	7	7	-
	Import expenses	"		35	-	35	-	-	-	35	-	35
	Equipment total			124	77	47	12	-	12	112	77	35
(2)	Installation Work											
	Radio	1 lot		8	-	8	8	-	8	-	-	-
	Wire telephone	"	Wiring etc.	51	-	51	-	-	-	51	-	51
	Inst. work total			59	-	59	8	-	8	51	-	51
	COMMUNICATION TOTAL			183	77	106	20	-	20	183	77	86

7. WATER SUPPLY

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Equipment											
	Turbine pump	2	3 m^3/min	28	28	-	-	-	-	28	28	-
	"	2	2 m^3/min, Industrial water	53	53	-	-	-	-	53	53	-
	Steel pipe	1 lot	6"ϕ x 3,360 m, "	43	43	-	-	-	-	43	43	-
	Turbine pump	2	0.5 m^3/min. Domestic water	24	24	-	-	-	-	24	24	-
	Steel pipe	1 lot	3"ϕ x 990 m	6	6	-	-	-	-	6	6	-
	Filtration tank	"		10	-	10	-	-	-	10	-	10
	Pontoon	1		6	-	6	-	-	-	6	-	6
	Electrical equip.	1 lot	Cubicle type station etc.	7	7	-	-	-	-	7	7	-
	Subtotal			177	161	16	-	-	-	177	161	16
	Ocean freight etc.	1 lot		17	17	-	-	-	-	17	17	-
	Import expenses	"		80	-	80	-	-	-	80	-	80
	Equipment total			274	178	96	-	-	-	274	178	96
(2)	Installation Work											
	Water tank	2	170 m^3, 100 m^3	13	-	13	-	-	-	13	-	13
	Piping etc.	1 lot		30	-	30	-	-	-	30	-	30
	Inst. work total			43	-	43	-	-	-	43	-	43
	WATER SUPPLY TOTAL			317	178	139	-	-	-	317	178	139

8. REPAIR SHOP

($1,000)

Item	No.	Specification	Total			Year (-2)			Year (-1)		
			Total	$	S/.	Total	$	S/.	Total	$	S/.
(1) Equipment											
Normal lathe	1	460 x 1,500	35	35	-	35	35	-	-	-	-
Drilling machine	1	50ϕ	6	6	-	6	6	-	-	-	-
Shaper	1	500 x 600	18	18	-	18	18	-	-	-	-
Grinder	2		6	6	-	6	6	-	-	-	-
Welding machine	3	A/C	5	5	-	5	5	-	-	-	-
"	1	Engine type	4	4	-	4	4	-	-	-	-
Dryer	1		15	15	-	15	15	-	-	-	-
Working table	1		11	11	-	11	11	-	-	-	-
Tolls, etc.	1 lot		20	20	-	20	20	-	-	-	-
Subtotal			120	120	-	120	120	-	-	-	-
Ocean freight etc.			13	13	-	13	13	-	-	-	-
Import expenses			59	-	59	59	-	59	-	-	-
Equipment total			192	133	59	192	133	59	-	-	-
(2) Construction Work											
Civil & building	1 lot	250 m^2	50	-	50	50	-	50	-	-	-
Installation	"		5	-	5	5	-	5	-	-	-
Const. work total			55	-	55	55	-	55	-	-	-
REPAIR SHOP TOTAL			247	133	114	247	133	114	-	-	-

9. AUXILIARY FACILITIES

($1,000)

Item	No.	Specification	Total			Year (-2)			Year (-1)		
			Total	$	S/.	Total	$	S/.	Total	$	S/.
(1) Access Road											
Construction	1 lot	1.5 km, By-pass	90	-	90	90	-	90	-	-	-
Improvement	"	7.0 km, Public road	68	-	68	68	-	68	-	-	-
Construction	"	11.0 km	441	-	441	441	-	441	-	-	-
Road total			599	-	599	599	-	599	-	-	-
(2) In-mine Road	1 lot	8.0 km	130	-	130	130	-	130	-	-	-
(3) Building											
Central office	1	One-story, 150 m^2	30	-	30	30	-	30	-	-	-
Central warehouse	1	" , 600 m^2	48	-	48	48	-	48	-	-	-
Mess	1	" , 150 m^2	18	-	18	-	-	-	18	-	18
Others	1 lot	*30 m^2, Guard house etc.*	4	-	4	4	-	4	-	-	-
Building total			100		100	82		82	18		18
(4) Vehicles Purchase											
Pickup truc	3	110 HP class	57	-	57	57	-	57	-	-	-
Large type jeep	2	"	20	20	-	20	20	-	-	-	-
Bus	1	Cap. 45-person	31	31	-	-	-	-	31	31	-
Bulldozer	1	14 t class	67	67	-	67	67	-	-	-	-
Shovel loader	1	1.2 m^3	30	30	-	-	-	-	30	30	-

9. AUXILIARY FACILITIES (Cont'd)

($1,000)

Item	No.	Specification	Total			Year (-2)			Year (-1)		
			Total	$	S/.	Total	$	S/.	Total	$	S/.
Forklift	1	8 t	10	10	-	-	-	-	10	10	-
Truck	1	1.5 t	40	-	40	40	-	40	-	-	-
Truck scale	1	30 t	60	60	-	-	-	-	60	60	-
			315	218	97	184	87	97	131	131	-
Ocean freight etc.			23	23	-	9	9	-	14	14	-
Import expenses			108	-	108	43	-	43	65	-	65
Vehicles total			446	241	205	236	96	140	210	145	65
AUXILIARY FACILITIES TOTAL			1,275	241	1,034	1,047	98	951	228	145	83

10. WELFARE FACILITIES

($1,000)

Item	No.	Specification	Total			Year (-2)			Year (-1)		
			Total	$	S/.	Total	$	S/.	Total	$	S/.
(1) Civil Work											
Site preparation	1 lot	6 ha	18	-	18	18	-	18	-	-	-
Access road	"	2.0 km	90	-	90	27	-	27	63	-	63
Civil work total			108	-	108	45	-	45	63	-	63
(2) Housing Work											
Family house	1 lot	Staff, 10-house, one-story	113	-	113	57	-	57	56	-	56
Bachelor quarter	"	Staff, 22-room, one-story	55	-	55	28	-	28	27	-	27
Family house	"	Employee·Worker, 264-house	1,901	-	1,901	432	-	432	1,469	-	1,469
Bachelor quarter	"	Employee, 20-room, 20-bed	30	-	30	30	-	30	-	-	-
"	"	Worker, 32-room, 96-bed	86	-	86	86	-	86	-	-	-
Housing work total			2,185	-	2,185	633	-	633	1,552	-	1,552
(3) Social Facilities											
Elementary school	1 lot	1,200 m^2	96	-	96	-	-	-	96	-	96
Kindergarten	"	250 m^2	20	-	20	-	-	-	20	-	20
Clinic	"	720 m^2	144	-	144	-	-	-	144	-	144
Canteen	"	580 m^2	29	-	29	-	-	-	29	-	29
Club house	"	420 m^2, Staff	38	-	38	-	-	-	38	-	38
"	"	200 m^2, Employee, worker	25	-	25	25	-	25	-	-	-
Social faci. total			352	-	352	25	-	25	327	-	327
(4) Others											
Water supply piping	1 lot	6"Φx 600 m, 4"Φx 4,000 m	67	-	67	67	-	67	-	-	-
Sewage piping	"	18"Φx 300 m, 14"Φx 2,000 m	133	-	133	133	-	133	-	-	-
Others total			200	-	200	200	-	200	-	-	-
WELFARE FACILITIES TOTAL			2,845	-	2,845	903	-	903	1,942	-	1,942

11. LIMA HEAD OFFICE

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Office Rental	1 lot	300 m^2	10	-	10	10	-	10	-	-	-
(2)	Fixtures	1 lot		30	-	30	30	-	30	-	-	-
(3)	Vehicle	1	Pickup 110 HP class	19	-	19	19	-	19	-	-	-
	LIMA HEAD OFFICE TOTAL			59	-	59	59	-	59	-	-	-

12. CONSTRUCTION FACILITIES

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Civil & Bldg. Work											
	Site preparation	1 lot		12	-	12	12	-	12	-	-	-
	Temporary bldg.	"	250 m^2, Office, warehouse	10	-	10	10	-	10	-	-	-
	"	"	300 m^2, Lodge, mess	21	-	21	21	-	21	-	-	-
				8	-	8	8	-	8	-	-	-
	Work total			51	-	51	51	-	51	-	-	-
(2)	Fixtures											
	Power house	1	75 kW Generator	15	-	15	15	-	15	-	-	-
	Office	1 lot		10	-	10	10	-	10	-	-	-
	Lodge, mess	"		23	-	23	23	-	23	-	-	-
	Fixtures total			48	-	48	48	-	48	-	-	-
	CONSTRUCTION FACILITIES TOTAL			99	-	99	99	-	99	-	-	-

13. CONSTRUCTION MANAGEMENT

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Labor Cost											
	Mine manager	1 lot	1 man, $2,000/month	48	-	48	24	-	24	24	-	24
	Asst. Mine manager	"	1 " , $1,000 "	12	-	12	-	-	-	12	-	12
	Staff	"	4 - 6 men, $500 "	60	-	60	24	-	24	36	-	36
	Employee	"	5 - 12 men, $200 "	41	-	41	12	-	12	29	-	29
	Worker	"	8 - 15 men, $150 "	41	-	41	14	-	14	27	-	27
	Expatriate	"	3 - 4 men, $4,100 "	345	345	-	148	148	-	197	197	-
	Labor cost total			547	345	202	222	148	74	325	197	128

13. CONSTRUCTION MANAGEMENT (Cont'd)

($1,000)

Item	No.	Specification	Total			Year (-2)			Year (-1)		
			Total	$	S/.	Total	$	S/.	Total	$	S/.
(2) Material Cost											
Fuel	1 lot		141	-	141	47	-	47	94	-	94
Lubricants	"		14	-	14	5	-	5	9	-	9
Gasoline	"		23	-	23	8	-	8	15	-	15
Office supplies	"		21	-	21	9	-	9	12	-	12
Others	"		20	-	20	7	-	7	13	-	13
Material cost total			219	-	219	76	-	76	143	-	143
(3) Expenses											
Generator purchase	2	175 kW	64	-	64	64	-	64	-	-	-
Travel expenses	1 lot		48	12	36	21	9	12	27	3	24
Miscellaneous	"		26	-	26	11	-	11	15	-	15
Expenses total			138	12	126	96	9	87	42	3	39
CONSTRUCTION MANAGEMENT TOTAL			904	357	547	394	157	237	510	200	310

14. LIMA HEAD OFFICE

($1,000)

Item	No.	Specification	Total			Year (-2)			Year (-1)		
			Total	$	S/.	Total	$	S/.	Total	$	S/.
(1) Labor Cost											
General manager	1 lot	1 man, $2,000/month	48	-	48	24	-	24	24	-	24
Staff	"	2 - 3 men, $500 "	30	-	30	12	-	12	18	-	18
Employee	"	3 - 5 men, $200 "	19	-	19	7	-	7	12	-	12
Worker	"	3 - 5 men, $150 "	14	-	14	5	-	5	9	-	9
Expatriate	"	1 man, $4,100 "	98	98	-	49	49	-	49	49	-
Labor cost total			209	98	111	97	49	48	112	49	63
(2) Material Cost											
Office supplies	1 lot		25	-	25	10	-	10	15	-	15
Miscellaneous	"		15	-	15	6	-	6	9	-	9
Material cost total			40	-	40	16	-	16	24	-	24
(3) Expenses											
Rental	1 lot	250 m^2 x $50/$m^2$	26	-	26	13	-	13	13	-	13
Travel expenses	"		12	3	9	6	3	3	6	-	6
Communication	"	Telephone, telex	17	-	17	7	-	7	10	-	10
Bank charges	"		15	-	15	7	-	7	8	-	8
Remuneration	"	Lawyer, etc. $4,000 x 2	8	-	8	4	-	4	4	-	4
Association	"	$2,000/yr.	4	-	4	2	-	2	2	-	2
Others	"		8	-	8	4	-	4	4	-	4
Expenses total			90	3	87	43	3	40	47	-	47
LIMA HEAD OFFICE TOTAL			339	101	238	156	52	104	183	49	134

15. OVERSEA'S COMMISSION

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Labor Cost											
	Salary A	1 lot	1 man, $3,500/month	84	84	-	42	42	-	42	42	-
	Salary B	"	1 - 2 men, $3,000 "	108	108	-	36	36	-	72	72	-
	Salary C	"	2 men, $2,500 "	120	120	-	60	60	-	60	60	-
	Labor cost total			312	312	-	138	138	-	174	174	-
(2)	Expenses	1 lot	15%	47	47	-	21	21	-	26	26	-
	OVERSEA'S COMMISSION TOTAL			359	359	-	159	159	-	200	200	-

16. INVENTORY

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Mining											
	Explosives	1 lot	2.0-month (20.8 t)	26	-	26	-	-	-	26	-	26
	Cap, detonator etc.	"	"	13	-	13	-	-	-	13	-	13
	Rod	"	" (202 pcs)	24	-	24	-	-	-	24	-	24
	Fuel	"	" (96 kl)	25	-	25	-	-	-	25	-	25
	Mining total			88	-	88	-	-	-	88	-	88
(2)	Concentrator											
	Ball	1 lot	2.0-month (45.0 t)	39	-	39	-	-	-	39	-	39
	Liner	"	"	14	-	14	-	-	-	14	-	14
	Sodium cyanide	"	" (3.0 t)	6	6	-	-	-	-	6	6	-
	KAX	"	" (5.3 t)	12	-	12	-	-	-	12	-	12
	Copper sulphate	"	" (11.3 t)	6	-	6	-	-	-	6	-	6
	Slacked lime	"	" (150.0 t)	20	-	20	-	-	-	20	-	20
	Frother	"	" (5.5 t)	15	15	-	-	-	-	15	15	-
	Concentrator total			112	21	91	-	-	-	112	21	91
	INVENTORY TOTAL			200	21	179	-	-	-	200	21	179

18. DETAILED SURVEY

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Tunnel prospecting	1 lot	1,763 m (1,233 + 530 m)	2,099	-	2,099	1,468	-	1,468	631	-	631
(2)	Additional boring	"	4,365 m (2,005 + 2,360 m)	623	-	623	286	-	286	337	-	337
(3)	Incline shafts	"	Portal making	48	-	48	48	-	48	-	-	-
(4)	F/S	"		325	175	150	87	12	75	238	163	75
	DETAILED SURVEY TOTAL			3,095	175	2,920	1,889	12	1,877	1,206	163	1,043

19. DETAILED DESIGN ETC.

($1,000)

	Item	No.	Specification	Total			Year (-2)			Year (-1)		
				Total	$	S/.	Total	$	S/.	Total	$	S/.
(1)	Labor Cost											
	Manager	1 lot	1 man, $3,500/month	42	42	-	-	-	-	42	42	-
	Salary A	"	2 men, $3,000 "	72	72	-	-	-	-	72	72	-
	Salary B	"	3 men, $2,500 "	90	90	-	-	-	-	90	90	-
	Salary C	"	2 men, $2,000 "	48	48	-	-	-	-	48	48	-
	Salary D	"	2 men, $1,000 "	24	24	-	-	-	-	24	24	-
	Labor cost total			276	276	-	-	-	-	276	276	-
(2)	Material Cost	1 lot	$200/man/month	24	24	-	-	-	-	24	24	-
(3)	Expenses											
	Field survey	1 lot		48	48	-	-	-	-	48	48	-
	Drawing	"		50	50	-	-	-	-	50	50	-
	Communication etc.	"		12	12	-	-	-	-	12	12	-
	Rental	"	120 m^2, $19/$m^2$/month	27	27	-	-	-	-	27	27	-
	Miscellaneous	"	10%	14	14	-	-	-	-	14	14	-
	Expenses total			151	151	-	-	-	-	151	151	-
	DETAILED DESIGN ETC. TOTAL			451	451	-	-	-	-	451	451	-

20. INTEREST

($1,000)

		Total	Year (-5 ~ -3)	Year (-2)	Year (-1)	Remarks
(1)	Pre-development					
	Detailed survey	3,095	3,095	-	-	
	Detailed design	451	451	-	-	
	Total	3,546	3,546	-	-	Down by capital
(2)	Direct cost	28,904	-	7,739	21,165	Total (1 - 17)
(3)	Capital	8,000	3,546	1,000	3,454	
(4)	Loans	24,450	0	6,739	17,711	
(5)	Interest	-	-	303	1,431	9% annum
	INTEREST TOTAL	1,734	0	303	1,431	