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2. CONCLUSIONS AND RECOMMENDATIONS

1. Zambia is a country whose economic parameters are generally much above those of the other countries in the region.

   Its economy depends on copper which directly represents a third of the Gross Domestic Product, over half of budgetary income, and 90% of exports.

   In addition, its economy is also greatly dependent on imports to maintain the standards of production, consumption, and wellbeing.

2. Zambia is a land-locked country, located in the center of the southern half of Africa, far removed from maritime communications and yet depending on them. The successive closing of access to Beira-Lorenzo Marquez and Lobito has created just as serious a problem for Zambia as the copper crisis.

3. In the absence of a systematic investigation of its mineral resources, Zambia's assets at this time are scarce. It is quite different if one considers the extraordinary abundance of one of these resources, that is, copper ores. Finally, Zambian industry generally depends on the outside for its raw materials.

4. Although ambitious programs exist for training technical and qualified personnel, means are limited. A marked tendency is to be noted in Zambia personnel of a higher level to occuply management and administrative posts rather than technical or directly productive ones.

5. Zambia's economy is controlled by development plans.

   The principal objective of the economic policy of the country has been, and remains, zambianisation.

6. The manufacturing industry in Zambia is small compared to the mining industry. However, some operations, such as ZAMEFA and the explosives factory KAFIRONDA, etc., are really worthwhile. Nevertheless, proceeding to those sectors that are most directly concerned in the present study, although they have tended toward an expansion of production, changes have been irregular in the most recent years, with frequent and notable fluctuations. The best prepared companies are generally under foreign control and depend in particular on foreign partners in the copper mining companies (NCCM and RCM), although the majority of the capital of these latter is paragovernmental.

Technologically, dependence on the outside is the norm throughout the industry.

There is a limited group of medium sized enterprises which are capable of improvement through new investment in equipment, acquisition of technology, and contracting of experts.

Today these industries are working in a limited way for the mining industry. However, they can be a good starting base for programed development for the manufacture of equipment and spare parts for the mining industry.

7. Generally speaking, a more or less scientific treatment has not been possible because of the irregularity in the series of data. This irregularity is not usually the result of inadequate statistical methods. The causes must be sought in the instability of the copper markets, the export of this product being the factor controlling import possibilities and the Zambian ecnomy. They are also to be found in the problems that the country has experienced in foreign trade because of the insufficiency of outlets to the sea open to Zambia.

8. At the present time, for reasons indicated in the preceding points, the economic situation in Zambia cannot be considered normal.

This situation is not considered in a study such as the present one whose target date is long range -1980 and 1985- assuming that normal conditions will be reestablished by then.

Consequently, it is estimated that the projects proposed are substantially valid.

9. Tecniberia proposes the following new plant projects, whose terms of reference for projects of new plants are included in section 6.

Project	Invoicing in 1980 (K)
1. Manufacture of Refractories	3,000,000
2. Complex Metal	
2.1. Foundry and Machine Shop	5,000,000
2.2. Manufacture of Hand Tools	1,200,000

10. Tecniberia proposes the reorganization of the following already existing Zambia enterprises.

Company	Products to be made
Foundry Engineering, Luanshya	Casting of brass and bronze
Vulcan Foundry, Lusaka	Casting of aluminium and iron
Scaw Ltd., Kitwe	High technology casting
Pigott Maskew, Kitwe	Retreading of tyres
	Rubber products
Hume, Luanshya	Alvenious pipes
Roan Engineering, Luanshya	Assembled steel
Copperbelt Manufacturing Engineering, Kitwe	Assembled steel
Diacarb, Ndola	Nuts and bolts
	Rock drill spare parts

11. Both the new plants proposed as well as the expansion and reorganization of those already in existence are based on the domestic market and, within this market, basically on the market composed of the copper mining industries. Nevertheless, although in their present state demand in the other industrial sectors is still limited, it should be considered. Over the long term (1980-85), such consideration is obligatory.

Within its natural limitations (the population of Zambia today is about five million inhabitants), the demand of the final consumers (public and private) should be considered with respect to some project. To be specific, the demand for hand tools can have a certain importance because of the domestic economies.

As things stand today, the foreign market should be considered secondary and accessory.

12. There is a great imbalance between the demand for equipment and spare parts in the mining industry and production possibilities for the same in the country.

Although this potential market exists, nevertheless there are difficulties in the way of expanding the sector.

These difficulties are:
Lack of incentives for expansion within the companies.
Scarcity of raw materials.
Lack of management and technical personnel.
Lack of trained manpower.
Insufficient contact between the mining and manufacturing industries.

13. Therefore, Tecniberia suggests that, beginning with a pragmatic formulation of objectives, an overall group of instruments be established for their achievement. These instrumentalities are specifically treated in section 7, and are related to tax treatment, repatriation of profits, investment tax relief, export tax relief, subsidies, credit, insurance, obligatory timetable for import substitution, agressive use of the tariff system, consulting and engineering institute, investment code and project management office.

14. Relating to purchases by the mining companies, Tecniberia recommends to evaluate the possibilities for standardization. With their natural limitations, homogeneous groupings should be established.

15. Relating to training programmes for skilled manpower according to the needs of the new plants proposed or expansion of the existing ones, Tecniberia recommends to carry them out in collaboration with the enterprises. These programmes and courses have to be essentially practical.

16. Finally, out of the scope of the present study, Tecniberia has thought of detecting other products lines which manufacture in Zambia is estimated possible or at least worthy to be studied. Among others:

- Clothing and shoes for the mining industry (an important part is imported).
- Detonators
- Chemical reagents
- Electric materials for general use

3. GENERAL INFORMATION

Zambia encompasses 752,900 km^2, and is centrally located in the southern half of Africa. This central location could offer certain advantages as the nucleus of trans-continental traffic but, in reality, these routes are not sufficiently developed and the disadvantages of its condition as a land-locked country far removed from maritime routes are aggravated. This disadvantages is of particular importance considering Zambia's volume of foreign traffic.

Climatic conditions are excellent, with a temperate climate. This factor, the abundant availability of water and the richness of its soils, contributs to its truly extraordinary possibilities for agriculture and cattle raising.

The availability of an abundance of water also means that the hydroelectric possibilities of the country are excellent, in spite of its being mostly flat.

As for mineral resources, to date no systematic investigation of these has been undertaken. Lacking this research, it cannot be stated at this time that extensive raw materials are available in the form of different minerals. On the other hand, one of these exists in enormous quantities: copper ore. Zinc, lead, and cobalt ores also have a certain importance.

Zambia lacks important energy materials. Only its coal reserve is worth mentioning, and it is not ample and is of dubious quality. Approximately one million tons are mined annually.

At the end of 1974, the population of Zambia stood at 4.7 million inhabitants. The annual growth rate had been 3% annually in the 1969-74 period.

The urban population in 1974 comprised 35.3% of the total. The growth rate of the urban population was 6.8% annually during the 1969-74 period.

The population density of Zambia is 6.2 persons/ km^2, and the most densely populated province is the Copperbelt with 33.4 persons/km^2.

Starting with independence, the development of the educational system in Zambia has been remarkable. Public expenditures for education went from K 12.6 million in 1964 to K 99.7 million in 1975. At the present time, approximately 80% of children in the affected age group are attending primary schools.

Instruction is free and begins at the age of seven.

From 1966 until 1973/74, the University of Zambia has granted the 1425 degrees (First, Diplomas, Certificates and Post Graduate). In 1964, the year of independence, the country had only 100 Zambian graduates.

In the field of greater interest for the present study, the principal goals of the government have been the following.

- Zambianization of the economy.
- Diversification of the economy and broadening the line of products exported.
- Redistribution of income.
- Self-sufficiency in agriculture and cattle raising.

The policy for attaining these goals has been spelled out in the development plans:

- Transitional Development Plan, 1.1.1965-30.6.1966
- First National Development Plan (FNDP), 1966-70.
- Second National Development Plan (SNDP), 1972-76

The GDP in 1974 reached K 1,820 million at current prices, Table 3.13 provides information on the percentage structure of the GDP and the rates of growth of the different sectors.

The manufacturing sector was one of the most dynamic in the period 1970-74, passing in this last year to second place in importance after the Mining and Quarrying sector and it should be noted that in this last sector activities such as Smelting and Refining are included.

In 1974 the GDP per capita was 388 K.

In the same year, the Gross Fixed Capital Formation reached K 520 million (28.5% of GDP).

In 1972 the working population of Zambia had risen to 1.5 million persons; that is, approximately a third of the total population.

More than 60% worked in agricultural activities, 12% in industry, 20% in services, and the rest in unclassified activities.

In all the years of the period 1964-74, these has been a surplus in the Zambia's trade balance, the coverage of imports by exports oscillating between a maximum of 246% in 1969 and a minimum of 122% in 1971 (179% in 1974). The balance of payments has shown different signs in the same period, oscillating between a surplus of K 128 million in 1969 and a deficit of K 188 million in 1971.

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(1 of 2)

PRE-FEASIBILITY STUDY FOR THE MANUFACTURE OF MINING EQUIPMENT IN ZAMBIA

FINAL REPORT

VOL I: MEMORANDUM

TECNIBERIA
MADRID - SPAIN

Copper has been Zambia's most important export commodity. In 1974, it represented 93% of Zambian exports (K 905 million).

Import duties are within theoretically acceptable limits in spite of certain changes that they have undergone in recent years.

Mining companies are subject to a special tax echedule on minerals which represents 51% of profits; the general tax schedule is applicable to other profits.

Essentially, this general schedule consists of the following taxes.

- Tax on corporate profits: 45%.
- Tax on capital gains: In general, 20%. Specifically, this is the rate applicable on stockholder's dividends and on royalties.

At the present time, repatriable profits are limited to the lesser amount resulting from the application of these two methods:

- 10% of invested capital
- 30% of profits after taxes.

4. GENERAL SURVEY

4.1. DEMAND

4.1.1. Analysis of Mining and Related Industries

4.1.1.1. General Aspects

Zambia's mining production in the last four years has been as follows:

	1971	1972	1973	1974		
				Production	Value (K million)	Employment
Copper	633	698	681	702	936.2	56,128
Cobalt	2.1	2.1	1.9	2.0	9.5	
Lead	27.7	25.9	25.0	24.5	8.0	2,884
Zinc	57.0	55.9	53.5	58.3	26.4	
Coal	812	937	940	810	7.9	985

Unit: 1,000 mt of converted metal for Cu, Co, Pb, Zn.
1,000 mt of coal, washed or unwashed.

Source: Central Statistical Office, Lusaka.

Small quantities of silver, cadmium, selenium and gold are also produced.

From the point of view of world mining, two materials are of international rank: copper, in which Zambia ranks fifth as a producer, and cobalt, where its contribution to international trade places it second in the world.

The quantities of run of mine moved in 1974 to obtain the productions indicated were as follows:

	Million mt
Copper	35.95
Zinc and lead	0.43
Coal	1.09

It would appear that the only mineral other than copper which offers possibilities for future large-scale exploitation is iron. Important reserves of better than 60% grade are estimated to exist. Nevertheless, more concrete data on reserves and the possibilities of putting these deposits into production have not been forthcoming. It seems that there is a study going on for its utilization as raw material to make pellets which would be used in a mini steel mill once the ores have been reduced.

Another possible mineral is nickel which exists in low grade.

Among those industries that, starting with quarried rocks, obtain a product usable in the construction industry or as a slagging medium are the following:

	Production (t)
Cement	485,000
Limestone flux and calcareous stone	984,000
Quicklime	126,000
Crushed stone and gravel	1,107,000
Sand	357,800

Source: Census of Industrial Production.

These industries generally utilize machinery that is similar to those used in mining.

According to data of the Census of Industrial Production (number of establishments, number of persons, value of goods and services, value of repairs and maintenance), it may be inferred that the only industry of a certain relevance, compared to the mining industry, is the cement industry, since the remaining industries producing construction material or slag are very small.

Copper mining is found practically all in the Copperbelt Province. The only copper mine that remains outside of this province is that of Kalengwa, which is situated at some 320 km from the Copperbelt.

Cobalt is obtained principally from the minerals at Rokana (Copperbelt).

Zinc and lead are produced at Broken Hill (Central Province).

Copper-bearing pyrite comes from the deposit at Nampundwe (Central Province) near Lusaka.

Coal is produced in Maamba (Southern Province).

The two cement factories are located in Ndola (Copperbelt), and in Chilanga near Lusaka.

4.1.1.2. Copper Mining

Copper mining is controlled by the two large companies NCCM and RCM. The production of finished copper in the fiscal year 1974/75 was 408,666 t and 288,564 t respectively, which represents a percentage of approximately 58% for NCCM and 42% for RCM.

Approximately 35% of the copper obtained in Zambia comes from open pit works, and the rest from underground mines.

a) Open pit

The greatest open pit production comes from the Chingola Division (NCCM), 199,310 t of copper. This represents 68% of the open pit production.

The open pit production in Chingola comes from four pits, one of which, Nchanga, represents 75% of the total in this division.

The relation overburden/run of the mine is 4 to 1.

The mining is done in benches 11 m high.

Stripping of rock clay is done by means of moto-scrapers.

Stripping of the remaining lining and mineral is done with explosives.

The loading is done by means of shovel excavators of 6 to 18 cubic yards.

These machines work electrically and use 3.3 KV.

Transportation is carried out by means of trucks of different brands-DART, Euclid, Electra Haul, etc. of differing capacities: 35, 45, 65, 85, 100 and 200 t.

As far as machinery is concerned, the biggest objection that could be made is to the lack of standardization, and this is especially true in transportation.

b) Underground

The RCM mine at Mufulira is the mine with the largest production in Zambia, and one of the best underground mines in the world. The mine has a high level of mechanization and uses heavy capacity machinery (loading shovels of 3 1/2 cubic yards) very unusual in underground operations, and above all for minerals that are not bulky.

The pumping installations for drainage are very good.

The installations for extraction, shaft and inclined planes are good, though some of these latter are rather old.

The crushing facilities located in the interior are good, although in the installation visited, level 730, the crushing and feeding machinery was somewhat old. However, this can be explained by the fact that this type of machinery has a very long, useful life.

c) Treatment and improvement

In Zambia, the installations used for the treatment and improvement of the copper minerals are:

Crushing and grinding
Flotation
Leaching.

A visit was made to the most representative installations in each of these cases.

The concentrating installation at Mufulira is a rather old one, into which improvements have been introduced in the flotation circuits to standardize the machines and obtain some excellent metallurgical results (96% recuperation). Nevertheless, it does not appear that they have made progress in the sense of reducing the consumption of balls and liners by trying out new materials.

The installation for leaching or lixiviation of cobalt at Rokana handles not only the minerals from NCCM but also those coming from RCM (Chambeshi).

The leaching or lixiviation plant for oxidized low grade minerals and the extraction by solvents at Chingola, is an installation that started functioning in 1974. It has a high capacity and advanced technology which permit recuperation of the copper content not only in low-grade concentrates, but also in tailings concentrates.

d) Metallurgy

The NCCM has smelting furnaces in Rokana, electrolysis tank house in Rokana (copper and cobalt) and in Chingola, and casting furnaces in Rokana.

The RCM has smelting in Luanshya and Mufulira, electrolysis in Chambishi and Ndola, refining furnace in Mufulira and casting in Ndola.

The divisions that do not have smelting plants send their high-grade concentrates by rail to the above installations.

e) Transportation and handling

The different mining divisions are linked to each other by railroad, with the exceptions of Kalengwa and Chibuluma.

f) Shops

The shops at Ndola, Mufulira, Luanshya, Rokana and Chingola were visited.

The shops at the Ndola refinery are small.

The machine shops at Mufulira, Luanshya and Rokana are important, with good machinery, but are dedicated exclusively to maintenance. They only make those parts that because of urgency or because they are not made elsewhere, cannot be imported or ordered from the local machine shops.

There is a very low utilization of the machinery, since employees only work one shift here. There are even machines that are used only occasionally.

The maintenance shop for loading shovels at Luanshya is very good.

The foundry has very few qualified personnel and little technology.

g) Warehouses

Visits were made to the warehouses of: Ndola, Mufulira, and Luanshya of RCM, and those at Rokana and Chingola of NCCM.

The warehouses have a good computerized system of stock control, and the high number of items is surprising on the order of 200,000 for RCM and 150,000 for NCCM. This is due on the one hand to the complexity of the installations and the different types of mining operations, and on the other to the lack of standardization of machinery. (The mines that actually belong to NCCM and RCM were, in the beginning, separate companies that utilized machinery of different brands and from different sources).

4.1.1.3. Coal Mining

Type of operation: Open pit

Ratio: $\frac{\text{overburden}}{\text{coal}} = \frac{2.5}{1}$

Production: 800,000 t/y washed coal.

Machinery utilized: To move the overburden, Bucyrus Eire dragline

Machinery utilized for loading coal: Caterpillar 998.

Machinery utilized for transport: 769 Caterpillar Trucks

System of treatment: Dense liquid (sink and float) and jigs

They do not have treatment of slimes

Characteristics of the washed coal: High content of ash, 19%; heat output: approximately 6,500 Kcal/kg.

In general there is little consumption of materials, since coal scarcely needs crushing and is not abrasive.

4.1.1.4. Cement Industry

As we have already indicated, only the cement industry is worthy of being included among industries connected with mining.

The factory at Chilanga was visited. This factory produces 250,000 t/y.

Transportation from the pit to the factory is made with Aveling Badford 17 to trucks.

In the factory, the crushing is done in three stages with Allis Chalmers machinery.

The process of cement production is the wet process.

The run of mine is wet ground in six Vickers mills with 500 CV motors.

The clinker is ground in an F.L. Smith mill of 1,200 CV.

The plant is old, the shops are vey small, and their machinery is scarce and old.

The warehouses are small.

They are carrying out tests to try to substitute the manganese steel mill liners with rubber. Apparently these are giving satisfactory results.

4.1.2. Other Sectors

In addition to the related industries which were dealt with in part 4.1.1., in Zambia there are other sectors which use some of the equipment or materials which are employed in the mining industries. These sectors are principally:

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FINAL REPORT

VOL I: MEMORANDUM

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a) Production of sulphuric acid: This type of industry uses materials that are resistant to corrosion, similar to those employed in the leaching plants and tank houses.

The production of sulplyric acid is in the hands of the copper industry, since it is obtained in recuperating the SO_2 from the smelting gases. For this reason, replacement parts are shown among the 350,000 items facilitated by the purchasing departments of the mines.

b) Railroads: The railroads are a potential client for casting (wheel assemblies) and boilermaking. Boilermaking is normally done in the railroad's own shops, while casting and machining wheel assemblies are ordered from non-railroad shops.

The consumption of mass-produced castings could be interesting but for the moment, given the short time TAZARA has been in operation, there are no representative statistical data available.

c) Agriculture: Agriculture could be a user of the following equipment or materials related to the mining industries:

- Pipes and accessories of steel, rubber, and plastics.
- Pumps.
- Hand tools

d) Public Works: This sector utilizes moving machinery (trucks, bulldozers, shovels, etc.) with characteristics similar to those at the mines. It also customarily uses crushing and screening machinery, and handling machinery, all with characteristics similar to the same equipment in the crushing plant of a copper mine.

Some of these industries, those of a more permanente nature, have been studied in part 4.1.1. There remain to be considered

only those which correspond to plans for new public works, such as highways, dams, etc.

4.1.3. Classification of Capital Goods and Spare Parts (Preliminary List)

The following list of products to be considered in the present study was drawn up in response to the conclusions reached by the team in visits to the mines and warehouses.

	Code
Metallic Products:	1
Pig Iron and Ferroalloys	11
Steel Products	12
Wire Bar Cores	13
Copper Products (Wire, Tubes, Pipes, etc)	14
Extrusion Products	15
Casting Products:	2
Pump Castings	21
Non Ferrous Metals Cast	22
Junction Boxes - Elect. (Cast-Alum)	23
Brake Shoes-Loco/Rolling Stock	24
Symons Crusher-Liners	25
Balls	26
Liners	27
Cylpebs	28
Hollow Screw Clamps	29
Rubber Synthetic Products:	3
Piping Hose	31
Retreading of Tyres	32
Rubber Belts	33

Open Mesh/Grid Flooring	75
Powar Generation Machinery	76
Agricultura Machinery	77
Machine Tools	78
Machines for Mining and Construction	79
Machinery and Machine Parts	80
Pumps and Valves	81
Impellers	82
Gears	83
Moulds, Dies	84
Components 150 RB Shovel/BE 40 Drill	85
Components Gyratory Drushers	86
Main Frames-Symons Crushers	87
Loco/Rolling Stock	88
Railway Vans, Wagons and Trucks	89
Others:	9
Moulds Wash	91
Refractory Bricks	92
Refractory Supplies-Cements	93
Heat Insulating Bricks	94
Grinding Wheels	95
Explosives	96

4.1.4. Quantification of the Demand

4.1.4.1. Imports

Following the classification established in the preceding section 4.1.3, an examination of the customs statistics was undertaken, 1969 having been chosen as the first year. Prior to that year, numerous important changes in the classification systems took place, making it really difficult (impractical on many

occasions) to trace a determined product, since each year it is included in a different series of diverse products. This same fact also occurs in 1969 and following years although in a much less noticeable manner. At any rate, in tables 4.4 to 4.36 which contain the 1969-73 import series of 133 types of products, frequent gaps may be noticed for 1969.

These tables have a double code. The first one refers to the classification established in section 4.1.3 for the purposes of this study. The second refers to the S.I.T.C. (Standard International Trade Classification), which is the system followed by Zambia to record its foreign trade statistics.

The 133 types of products included in these tables were extracted from the Annual Statement of External Trade corresponding to the period 1969-73. Criterion for their selection and later research was the estimate of the team as to the possibilities of their manufacture in Zambia.

The value shown in the customs statistics is FOB at point of origin and not CIF Zambia.

Table 4.37 shows the customs duty and surtax on all merchandise included in tables 4.4 to 4.36. In table 4.37 only the S.I.T.C. Code has been used, and in strict numerical order, in order to show clearly the customs duty and surtax on the merchandise included in the import series.

4.1.4.2. <u>Purchases by the copper mining companies</u>

The mining industries have a piece by piece classification of all the requirements of the different mines.

This classification is done by the purchasing department; its objective is rapid location of a spare part in order to go ahead and buy it.

The volume of items presently utilized, 350.000 between the two mining companies, and particularly the system of presenting data, make it practically impossible to utilize this channel for a direct quantification of demand on the part of the mining companies, since the items included in each chapter are not homogeneus as to weight, materials out of they are made, manufacturing processes, etc.. On the other hand, one of the mining companies does not offer overall data for each chapter, not even in value.

Under these conditions, the attempts at direct quantification of demand on the part of the mining companies has produced scant result.

Table 4.38 shows the purchases of NCCM in 1974 of certain determined types of items, classified in accordance with the code established in section 4.1.3.

Table 4.39 shows the items imported by RCM which this company estimates can be manufactured locally, and their value. This company has constituted an Import Substitution Committee and table 4.39 mentioned above is a summary of its labors up to the dates that the Tecniberia team remained in Zambia.

It is estimated that the visit of the Tecniberia team was ahead of the moment in which valuable, usable information would be available. This information, referred to one of the companies, NCCM, will be completed in the period from 1976 to 1977, although during the stay of the team in Zambia they had not yet begun to work on the systems of utilizing those blocks of information which are going to be made available.

4.1.4.3. Other sources of data

Table 4.40, also adapted to the code established in section 4.1.3 shows demand figures in 1974 for a certain number of items. These figures were arrived at by means of a direct survey made by the Tecniberia team to consumers and local suppliers, but referred to import items.

4.1.4.4. Demand forecasts

Table 4.41 contains the demand forecasts of a part of the items assigned in the classification of section 4.1.3. These forecasts have been obtained, having made two successive exclusions. In the first place, those items assigned to section 4.1.3 have been excluded about which it was not possible to obtain quantitative data on present demand, either through customs statistics, information coming from the copper mining companies, or other sources.

In the second place, those items have been excluded which, although having data from the sources cited, the scant importance of their present demand compared to the investments and installations required for their production in Zambia, in no case justifies a later more detailed analysis, because the low level of demand would not justify their manufacture in Zambia.

4.1.5. Export Possibilities

Zambia's foreign trade with nearby countries is quite limited, especially if trade with the Republic of South Africa is not considered. Moreover, trade with South Africa has decreased greatly, to the point where imports from South Africa in 1974 only represented half of the respective imports for 1967 and exports to this country have been reduced to one eighth in the years cited.

Based on 1973 data, leaving out South Africa and Rhodesia, foreign trade with neighboring countries amounts to the following figures:

- Imports: K 18,553,000 (5.34% of total imports)
- Exports: K 12,136,000 (1,63% of total exports)

Exports to these countries, by tariff sections, are distributed as follows:

Exports		
Section	K 1,000	%
0. Food and live animals	2,882	23.7
1. Beverages and tobacco	3,607	29.7
2. Crude materials, inedible, ex. fuels	303	2.5
3. Lubricants, fuels & related materials	47	0.4
4. Animal and vegetable oils and fats	-	-
5. Chemicals	222	1.8
6. Manufactures based chiefly on material	4,260	35.1
7. Machinery and transport equipment	692	5.7
8. Miscellaneous manufactured articles	44	0.4
9. Misc. commodities & transaction n.e.s.	79	0.7
TOTAL	12,136	100.0

The importance of section 6 must be weighed, bearing in mind that 65% corresponds to zinc, 18% to lead, and 6% to copper.

Zaire is the country of theoretically greatest interest to Zambia. Although it is true that the greater part of exports to Zaire are included in section 0, this country also bases its economy

on copper. This dependence on copper is not as marked as in Zambia, but they use a considerable number of equipment and spare parts similar to those used in Zambia. As a matter of fact a certain amount of exports of interest must be recorded, concretely, the export of diamond bits and crowns, for a total of 157,063 K in 1973.

Nevertheless, one cannot expect too much of export possibilities to Zaire of the products that are the subject of this study. In the first place, because what are probably the best work shops in Africa are found in the Lumumbashi mining area. Second, this would require coordination between multinational companies with different interests.

The possibilities of export to other nearby countries are estimated to be even more limited, both because of the problems in coordinating the outlining of a common line of action and division of labor on a regional scale as well as the fact that, excepting for South Africa and Rhodesia, the industrial development of these countries is still limited.

A problem that has to be solved before attempting to consolidate a flow of industrial exports to neighboring countries is that of the uncertainty of payment for exports, which in many cases results simply in a lack of payment.

The generally limited domestic market, as well as the lack of industrial raw materials and the geographic position of the country, results in the need for planning such dimensions for industrial establishment in Zambia, that zambian industrial products are not competitive in neighboring countries with those coming from other sources. The greatest export possibilities are found in finished copper and concrete products. ZAMEFA, a pro-

ducer of copper wire, rods, and cables could have an excellent export future, not so much to the neighboring countries which still consume only limited quantities but to the world market.

At the present time, the possibilities for Zambian export of products not based on local raw materials are limited. This is caused by the fact that, in addition to other factors, products such as those considered in this study which must be transported twice (as finished products and previously as raw materials) and the transport costs are really high.

This report was prepared by a Tecniberia team of experts composed of the following persons, listed in alphabetical order.

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- Lozoya, José A.	Economist
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- Plá, Manuel	Mechanical Engineer
- Turiel, Luis	Economist
- Villagarcía, Jerónimo	Dr. Mechanical Engineer

4.2. INDUSTRIAL POSSIBILITIES

4.2.1. The Manufacturing Sector in Zambia

The manufacturing sector has already attained a certain importance in Zambia. In June of 1974, salaried employment in this sector reached 43,130 persons, which represented 11.2% of the total for salaried employment. The Gross Product generated by this sector in 1974 reached K 242 million, representing 13,3% of the GDP, while in 1964 it only represented 6.8%.

As was indicated in chapter 3, the manufacturing sector has been one of the most dynamic in the Zambian economy since the country's independence. Nevertheless, there have been notable differences among the different types of industries. The most dynamic subsectors have been Rubber, Chemicals, and Fabricated Metal products; and the least dynamic, Basic metals, and Non-metallic mineral products.

Both because of the number of employees as well as the value added, the principal subsector is Food, Beverage, and Tobacco. The subsector Chemicals, Rubber, etc. is second in importance for value added and fourth for the volume of salaried employees. The subsector Fabricated Metal Products, etc. is in third position under both of these concepts.

2.1% of industrial establishements have 500 or more workers; 17.1% have 100 or more workers; 66.9% have fewer than 50 workers.

The manufacturing industry is concentrated in the Copperbelt-Central-Southern Provinces axis, particularly in the Copperbelt.

The SNDP predicts a program of investments of K 244 million (in 1969 values) in the manufacturing sector during the period of time it covers (1972-76). The Mid-Term Review of the SNDP indicates certain out-of-phase conditions.

Although it was not possible to have available quantified information on the utilization of existing productive capacity, the Mid-Term Review of the SNDP pointed out that in 1973 a large proportion of industry was underutilizing its capacity. This situation was verified by the Tecniberia team during their stay in Zambia during visits to different industries.

The SNDP places special emphasis on the substitution of imports. Important accomplishments must be recorded and others are nearing completion: automotive assembly plant, expansion of Kafue Textiles and Kabwe Industrial, explosives factory at Kafironda, Oil refinery, etc. Nevertheless, the substitution of the import of intermediate and capital goods has not attained sufficiently high levels especially in the sector of basic metal products.

Related to other objectives of the SNDP, the most outstanding success has been ZAMEFA (Metal Fabrication of Zambia Ltd.), both because of their contribution in the further processing of raw materials from mining, as well as their creation of jobs and promotion of exports (ZAMEFA produces copper wire, rods and cables).

According to the 1972 Census of Industrial Production work in the manufacturing sector is distributed as follows, based on the type of ownership of the enterprises

	% of employment
- Private property	58%
- Paragovernmental enterprises	36%
- Public property	6%
	100%

As is shown, most property is private. Practically all private enterprise in Zambia is owned by foreign companies or by non-Zambians who are long time residents with temporary residence permits.

The Ministry of Mines and Industry is the government organ responsible for industrial policy and it acts fundamentally through the paragovernment companies. The principal company is ZIMCO (Zambian Industrial and Mining Corporation Ltd), a holding company.

ZIMCO has other subsidiary holding companies. The principal one is INDECO (Industrial Development Corporation), that, in 1975, participated in 36 industrial enterprises; of these, they were majority shareholders in 17 and had all the capital in 17.

The Development Bank of Zambia began operations early in 1974. The Government, paragovernmental companies, and private companies participate in its functions. It is still too early to judge its accomplishments.

Industrial Finance Corporation (owned by FINDECO, which, in turn, is owned by ZIMCO) is the institution charged with making credits of up to 25,000 K available for small projects.

4.2.2. Industrial Branches Related to the Study

The Gross Product generated by the basic metal and fabricated metal industries reached 37.9 million K in 1974.

	GP (10^6 K)	% of Industrial Product	% of total GDP
- Basic metal industries (excluding copper refining)	5.3	2.19	0.29
- Fabricated metal products, machinery and equipment industries	32.6	13.47	1.79
	37.9	15.66	2.08

Between 1965 and 1974, always at current prices, the basic metal industries grew 18% and the fabricated metal industries 472%, increments that signify an average annual rate of 1.8% and 21.4% respectively. At constant 1965 prices, the respective annual average growth rates are -4.4% and 13.9%.

Table 4.45 presents information on the number of establishments, their size, and employment in the industrial sectors now under consideration. With its five establishments and 849 employees, the basic metal industries represented 0.9% of the industrial establishments total and 2.1% of the employment in 1973. As for fabricated metal industries, this sector represented 25% and 19.1% respectively.

In reality, within the sector of basic metal industries, only one foundry enterprise located at Kitwe is important. In 1973 it employed 687 persons, i.e. more than 80% of the employment in this sector.

The sector of fabricated metal products, equipment and machinery is of greater importance and in the previously cited Table 4.45 a breakdown by types of activity is made. The most important group consists of structural metal products that represent 26.4% of the establishments within the sector and 33.9% of employment. Following in importance is the group called

fabricated metal products (in the strict sense and not the general sense which has been used here to refer to the entire sector), with 20% of the establishments and 17% of employment.

It should be pointed out that in the industrial sector overall, excepting for the branches of paper and paper products, and unclassified industries, it is precisely the branch of fabricated metal products, machinery, and equipment that shows the smallest size, 55 employees per establishment. On the other hand the basic metal products branch (always leaving out copper refining) shows the greatest size, 170 employees per establishment. However, this is not a significant figure, considering the very low number of firms and the presence of one that by itself had 687 employees in 1973.

The SNDP makes the following forecasts for the industries considered in this section.

		K million (1969 prices)		
Major group	Employment 1976	Fixed investment 1972-76	Gross output	Value added
Basic metal	7,000	57.0	95.0	28.5
Metal working and machinery	10,300	28.2	79.0	36.5

4.2.3. Evaluation of Existing Installations Related to the Manufacture of Equipment and Spare Parts for the Mining Industry

In the data cards of annexes 2 and 3, an evaluation is made of each company visited.

Here we make an overall evaluation, placing them in three groups:

- Those belonging to the mining industries
- Dependent enterprises
- Other enterprises

1st) Mining Company Workshops

The company workshops are exclusively operated for maintenance of the installations. They have few personnel for the number of machine tools installed. Thus, the number of real work hours for the machines is very low compared to possible capacity.

There are machines that are practically shut down, and that are only used in case there is a part to be repaired which can not be obtained from abroad.

The maintenance shops are very well equipped to prevent stoppages in the production facilities. From this point of view this fact is quite important. However, just as if they were independent units, they are not at all directed toward securing the maximum return on the capital invested in them.

Up to now it has been relatively easy to obtain spares from abroad and the mining companies with few exceptions, because of the difficulties of production in the country, have not developed a program for making them themselves.

2nd) Dependend enterprises

Scaw Ltd. Kitwe

A company dependent on Anglo-American. It is a very well equipped foundry, working with a high output, mass producing grinding balls and carbon and manganese steel parts.

Production capacity of more than 40,000 t/year makes it an important industry, even outside of the country.

This industry is not suitable for producing parts in small runs.

Diacarb, Ndola

A company dependent on Anglo-American. It is a very well equipped plant, manufacturing many sophisticated, high quality products: diamond crowns and drilling material.

Their client is the mining industry.

3rd) Other enterprises

Only factories making equipment or parts for the mining industry will be analyzed here.

There is one sector that is self sufficient: The manufacture of thick steel pipe with flanges. Hums in Luanshya and Tssolin and Darioli in Kitwe supply mining requirements.

There are other good factories such as African Wire which makes cables. In the types it makes it is sufficient for the country.

Next comes a group of enterprises that cooperate with the mining companies, although in a relatively limited manner.

These companies are (see Annex 3):

- SKF, Kitwe.
- Cullinan, Kitwe.
- Copperbelt Steel Manufacturing Company, Kitwe.
- Pigott Maskew Ltd., Kitwe.
- Congar, Kitwe.
- Roan Enginsering, Luanshya.
- Foundry and Engineering Co. Ltd., Luanshya.
- Vulcan Foundry, Lusaka.
- Zambia Steel, Lusaka.

The whole group amounts to 1,400 persons and hardly more than 25% of its production works for the mining sector.

Bearing in mind that the copper industry includes 56,128 persons, one can perceive the enormous imbalance of these enterprises with respect to the mining industry.

These companies have big problems as well as serious limitations of productive equipment. They lack specialised personnel for expansion and they have no constant work programs related to the subject we are studying.

Nevertheless, it is considered that they can serve as a basis for programmed development with appropriate help.

After these, small workshops exist which cannot be considered in this study.

4.2.4. Projects of the Second National Development Plan

In preceding sections, the general objectives defined by the SNDP for the manufacturing sector, together with investments and predicted growth rates, have been outlined.

The SNDP is more normative than positive and instrumental. In these last senses, the SNDP is a compiling of news concerning on-going projects, those that have a certain possibility of being undertaken, or those that would be worth studying.

In particular, and affecting the object of the present study, the SNDP forecasts investments, gross output and value added for 1976, and records that: "A report on metal working

industries shows the need for another cast iron foundry and the opportunity to establish a plant producing welded steel pipes". (1)

Other brief references are made to ZAMEFA (without mentioning this name) in the basic metal products and fabricated metal products sectors, and to the production of bus, lorry, railroad car bodies, etc.

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(1) SNDP, page 179.

5. PRE-FEASIBILITY STUDY

SUMMARY

5.1. AVAILABILITY OF RESOURCES

5.1.1. Manpower, Professional and Technical Training

The availability of qualified manpower and technical personnel of Zambian nationality is scarce at the present time.

Although it is true that certain manufacturing industries have a relatively high level, it is likewise true that, in general those positions requiring a certain qualification level are filled by expatriates.

The mining companies, more specifically-copper (RCM and NCCM), are those that have a higher technical level in Zambia and consequently have better and more numerous qualified personnel, but the problem exists of replacing expatriate personnel with Zambia personnel.

The mining companies have their own training centers, some in the companies themselves; others, on the outside. Whether these are theoretically autonomous or not, they are really dependent on the companies. Moreover, the mining companies capture the majority of qualified, technical personnel trained in other centers, because of the salary and future they offer as well as the numerous other social advantages.

Table 5.1. shows the supply of Engineering Technicians and Technologists up to 1980, it wasn't possible to obtain reliable information before 1974.

Table 5.2 shows the promotions of qualified personnel for the period 1971-74 and the prediction up to 1980. The table 5.3 shows the plan for obtaining the different qualifications.

The following institutions would provide technicians and skill labor related to the subject of the present study. The specific necessities of the specializing personnel are enumerated together unith the description of the proposed plants in the sub-chapter 5.5.

- ZIT (Zambia Institute of Technology). Kitwe	- Electrical, Instrumentation, Mechanical and Metallurgy technicians and technologists.
- NORTEC (Northern Technical College). Ndola	- Electrical, Mechanical Drafting, Structural Fabrication and Mechanical technicians and technologists. - Electricity, Heavy Equipments, Machine, Metal Fabrication and Sheet Metal skill labor.
- Kabwe Trades Training Institute. Kabwe	- Heavy Equipment and Metal Fabrication skill labor.
- Luanshya Trades Training Institute. Luanshya	- Electricity skill labor.
- Lusaka Trades Training Institute. Lusaka	- Electricity, Machine and Metal Fabrication skill labor.

The Government is in the process of conducting an educational sector review, but very little information is available about the aims and progress of this review.

Lastly, these is presently also Government support available for the creation of community-based school-leaver vocational training programmes, but this assistance is still in its nascent stages.

In February 1975, an extensive training programme was announced which includes about one hundred youth-oriented specialties which will accomodate 42,400 students in 1975. There is hardly any information available on the development of this massive program.

5.1.2. Engineering, Technology and Know-how

Although there are many firms that include the work "Engineering" in their official name, the truth is that real engineering firms are few in Zambia.

Production enterprises do not have important technical sections either, as far as design is concerned, and they are limited to the production section of the large enterprises. For the most part, they are inexistent in medium and small firms.

Moreover, practically all the most outstanding enterprises have connections with non Zambian firms through which they obtain their project engineering.

As for technology and know-how, the norm is a dependence on foreign sources, except for very simple products.

5.1.3. Raw Materials

Leaving aside agriculture and cattle raising, the availability of natural resources is explained in the chapter devoted to natural conditions and the analyses of the mining industry.

In the analysis of the industry of transformation, dependence on foreign sources is a general rule with respect to the raw materials, apart from copper.

5.1.4. Energy and Water

Zambia lacks energy-producing minerals, except for a low grade coal obtained in Maamba whose annual salable

production has stabilized at less than one million tons.

Zambia is self sufficient in electricity and this situation is assured for an extensive period. More than 90% is generated by hydroelectric plants. It is quite clear that there are no problems in this area.

The electricity delivered to consumers in 1974 reached 5,508 million kwh and the production was 5,973 million kwh (without taking into account electricity transmitted from Rhodesia).

The growth of consumption for the period 1964-1974 averaged 7.3% annually.

In 1974 per capita consumption reached 1,173 kwh but this figure must be weighed carefully. Leaving aside the electricity consumed by the copper industry, per capita consumption in 1974 reached 321 kwh.

The price of electricity is really low in Zambia, varying between K 0.008 and 0.010 kwh, according to use and utilisation factors. (In 1973, electricity imported from Rhodesia was at a price of K 0.004 kwh, according to customs statistics).

As far as water supply is concerned, approximately 75% of the urban population and more than 10% of the rural is served by piped-water systems. This population represents approximately two million persons and consumes 350 million m^3 annually, or 480 liters per inhabitant per day.

Naturally, industrial use is included in this figure. However, it gives a clear idea that water will present no problems for the establishment of new industries. This is confirmed by the projects in progress which plan to supply 4 million persons with piped water systems with an average consumption of 400 liters per person per day in 1986.

5.1.5. Transportation

Transportation infrastructure in Zambia is relatively well developed. The network includes 35,000 km of roads and highways and 2,000 km of railroad.

Of those 35,000 km of roads, 4,000 km were blacktop, 7,500 km were gravel (all-weather capability), and 7,500 km were classified as dirt roads. The remaining 16,000 km were not classified.

Before TAZARA was opened, Zambia had 1,068 km of railway, 827 km on the main line, and 241 km, on the secondary network. The TAZARA has added 892 km, bringing the total to 1960 km, equal to a density of 2.6 m/km^2. This density increases greatly in the most active areas of the country, particularly in the Copperbelt Province.

Zambian railways are directed toward foreign countries, as is proved by the fact that with only 2,000 km they have access to the most important ports of the region, through the appropriate linkups with the railways of neighbouring countries.

River navigation is of little importance in Zambia. The transport of oil by pipeline is important and has undergone the following evolution.

	Oil import by pipeline (t)
1969	362,243
1974	950,000 (provisional)

Zambia has 150 airports, a third of which are state property. Naturally, most of these airports are of little importance and are not usable all year but the Zambia air net-

work is undoubtedly of a relatively high level. The Lusaka International Airport is the principal installation in the country and has a high standard of quality.

Zambia, a land-locked country, depends a great deal on its transport system, both on account of its geographic location, as well as the importance that foreign traffic has for the economy of the country. In 1974, foreign mercanchise traffic represent in value more than three-fourths of the Gross Domestic Product.

For these reasons, being a land-locked country and relying closely on foreign trade, Zambia depends on its neighbours. The principal surface routes between Zambia and the maritime ports are the following:

Rail

- To Lobito, through Zaire and Angola, 2,641 km from Lusaka.
- To Beira (and Lourenço Marques), through Rhodesia and Mozambique, 2,046 km.
- To Dar-es-Salaam by the TAZARA, 2.042 km.

Road

- To Dar-es-Salaam, 2,090 km
- To Mombasa, through Tanzania and Kenya, 2,350 km.

Road-Rail

- To Beira and Nacala, by road to Malawi and by rail from Malawi to the aforementioned ports, 1,655 and 1,750 km respectively.

In 1970 the volume of import traffic was double the export (1.86 and 0.94 million metric tons respectively). This means that to the already high cost of covering distances of more than 2,000 km was added the cost of half of this traffic moving empty in one direction.

In 1974 this problems is concealed because, as some of the routes to Zambia close down, imports (1.02) and exports (0.94) even out to the maximum allowed by those routes that remain open.

In 1972, Zambia had already begun to have transportation problems. The principal facts and their consequences since then are the following:

- Closing of the border with Rhodesia in 1973, eliminating the shortest and cheapest access to the sea via Beira.
- The need to reroute 60% of total foreign traffic which used to pass through Rhodesia toward other ports, principally Lobito, Dar-es-Salaam, and Mombasa, and also toward Beira, via the road to Malawi.
- Substantial increase in transportation costs, reduction of foreign traffic because of the inadequacy of new routes to support the additionel load of traffic to and from Zambia, and irregularity in the traffic.
- Opening in 1975 of the TAZARA (Tanzania-Zambia Railways).
- Angola War of 1975, closing the Port of Lobito.
- Congestion in the Port of Dar-es-Salaam and rerouting of traffic to Mombasa, which is itself overcrowded.
- There has been a steep increase in Dar-es-Salaam port fees.

In 1973, with the Rhodesian border closed, the cost of transportation of imported merchandise averaged as follows:

	K	
Border	T	T/km
Zaire. Railway from Lobito	30.80	0.013
Tanzania. Road from Dar-es-Salaam	49.10	0.025
Malawi. Road/Railway from Beira	60.50	0.036

During the stay of the Tecniberia team in Zambia, they were informed repeatedly that the cost per ton from Dar-es-Salaam by road reached 150 K and even more, but they received no documentary proof of this.

The TAZARA rates are not known, but apparently Tanzania had asked for a major revision of those already agreed upon.

5.2. PRIORITY LIST

5.2.1. Determining Priority Manufactures

All of the products on the preliminary list (sub-chapter 4.1.3) will be studied in order to determine a list of prioritiee which will be given at the end under heading 5.2.2.

1. METALLIC PRODUCTS

11. Pig Iron and Ferroalloys

Neither pig iron nor ferroalloy imports (Table 4.4) reach quantities technically sufficient to warrant their manufacture in Zambia.

12. Steel Products

Items 67254, 67311, 67485, 67489, 67621 and 67629 (SITC Code) in Table 4.5 are excluded because their import value is of little importance.

For a reason similar to the one given for ferroalloys previously, the remaining items have to be discarded, with the exception of 67321 and 67341.

However, these products are being studied by other institutions.

13. Wire Bar cores

NCCM makes these products in Mufulira but only provides for the needs of the Mufulira plant.

A plano-mill could supply the requirements of NCCM/RCM, and perhaps with incentives the private sector would be able to undertake this activity.

They could also be substituted by products cast at Foundry and Engineering Co., Luanshya, but present estimates are not economical.

It goes on the list of priorities.

14. Copper Products

The products in table 4.6 must be diecarded for reasons similar to those expressed in nº 11 of Own Code (Pig Iron and Ferroalloys).

15. Extrusion Products

The series in table 4.7 are descending, because of the action of ZAMEFA. Therefore, these products are not included in the present priority list.

2. CASTING PRODUCTS

21. Pump Castings

RCM has maintained contacts with Eimco (Envirotech) to manufacture pump componeats in Zambia. Nevertheless, they did not find the project viable since they get better prices from RSA.

The types of pumps are so diversified that it is not possible to produce them economically within the present local manufacturing plants.

There are serious problems in obtaining raw materials, licenses, etc.

An export maket will be required in order to achieve economical production.

These problems are clear and should not be underestimated. We believe, nevertheless, that the means should be provided for making those parts that are compatible with the factories that are later proposed, without dedicating an entire company to this single objective.

It goes on the priority list, although no forecasts are made in table 4.41.

SUMMARY

22. Non Ferrous Metals Cast

Estimates for Cored/Solid Phosphor Bronze Sticks have been requested from two companies.

Foundry and Eng. of Luanshya gives a favorable price compared to imports from RSA.

Scaw Ltd of Kitwe does not give an estimate because there are problems in obtaining the necessary technical staff to undertake projects, expansion, and diversification plans outside of present producte.

This problem should be solved and goes on the priority list although no forecasts are made in table 4.41.

23. Junction Boxes - Elect. (Cast-Alum)

They are received from Alrite Eng. Supplies Ltd., RSA.

The production of the cast boxes can be handled by Vulcan Foundry which ie encountering serious raw material problems.

It goes on the priority liet with a demand of 187,000 K by 1980.

24. Brake Shoes - Loco/Rolling Stock

They can be manufactured locally by Vulcan Foundry and Scaw Limited but they have raw materials problems.

Scaw has an adequate inetallations for manufacturing these pieces.

It goes on the list of priorities with a demand of 94,000 K by 1980.

25. Symons Crusher - Liners (Cast)

Scaw has manufactured a liner for a Symon crusher.

There were measurement problems since they had no manufacturing plans to work from.

It is a piece requiring much technology in its manufacture and is a step forward toward resolving more difficut problems.

26. Balls

The balls imported by the cement industry are made of heat treated carbon steel.

Scaw which produces 30,000 t/year for copper mining has installations for producing the quality of imported balls and its technology can be acquired.

It goes on the list of priorities with requirements of 775 t/annually by 1980.

27. Liners

Scaw manufactures the largest share of liners consumed by the mining industry and is trying to solve more complicated problems.

The cement industry imports mill liners that can be manufactured by Scaw. Other industries, such is limestone gravel, etc., also use a certain amount of imported liners.

It goes on the list of priorities to produce 625 t by 1980.

28. Cylpebs

The cylpebs that the cement industry presently uses are made of: heat treated carbon steel, and high chrome alloy.

At the present time, the manufacturing technology for cast cylpebs utilized in the cement industry and which can be manufactured at Scaw can be acquired through the payment of a royalty.

This is not to say that they conform to the same qualities that are presently imported.

It goes on the list of priorities to manufacture 1125 t in 1980.

29. Hollow Screw Clamps

The raw material is brass.

Samples have been manufactured in Foundry and Engineering Services, Luanshya.

The quoted price is somewhat higher than the price of importing from Ohio Brass, U.S.A.

Nevertheless, if the present facilities are improved they should be made in the country.

It goes on the list of priorities for a requirement of 187,000 K in 1980.

3. RUBBER SYNTHETIC PRODUCTS

31. Piping Hose

Pigott manufactures low pressure piping hose. Industrial needs for higher pressure piping hose are important.

Contacts should be continued between the mining industries and Pigott for the purpose of substituting imports.

32. Retreading of Tyres

Pigott considers it possible to initiate retreading of tyres which can save 1,000,000 K in imports.

It goes on the list of priorities.

33. Rubber Belts

The manufacture of these products requires large investments and installations which are not justifiable in Zambia on the basis of quantities imported.

34. Pump Components - Rubber

At the present time, Pigott manufactures components in general as well as pump components in particular.

Other manufactures could be undertaken.

They have tried to make rubber lined parts for Hydroseal and Centriseal pumps that are presently imported from RSA.

In order to make these parts, three companies are involved.

Eimco, the propietor of the pump licenses.

The manufacturer of the machined part.

Pigott & Maskew who make the rubber lining.

But the final manufacturer, Pigott, who could bill the mining industries directly, declines all responsibility for the quality of the machined part.

It goes on the priority list with a demand of 427,000 K by 1980. Although the consumption of the mining companies is important (it will be possible to substitute 75,000 K of imports of just one product), the products now being considered have very numerous uses in Zambia.

35. Polyester Resin Products

Leco is attempting to get these manufactures in production, but the difficulties of obtaining the import license for outstanding heating equipment have delayed start up of the plant.

36. Underground Support Insulators

Tests have been made with locally manufactured parts. They are not comparable with imported parts although they are considered adequate to use.

Possible manufacturers are Leco Ltd., Luanshya and Glass Fibre Construction Ltd., Chililabombwe.

Requirements for 1980 are estimated at 117,000 K.

4. PIPING

41. Pipes

Tesolin and Darioli Engineering of Kitwe, and Hume (Zambia) Ltd. of Luanshya make thick steel pipe with flanges. Their production capacity is sufficient for the needs of the country and they could even export to Zaire.

Zambia Steel of Lusaka makes welded 1/2" to 3" low pressure pipe.

Welded pipe for higher pressures and unwelded pipe are not made in Zambia.

This latter requires a large investment and neither the iron and steel facilities needed for the production of the basic steel nor a sufficient maket exists.

An attempt must be made to substitute imports with pipes presently being produced in the country.

Such is the case of the lancing pipe which they are trying to produce in 3/8" diameter.

The sockets for this pipe are imported.

If the lancing pipe should prove satisfactory, the market for 1980 will be 375,000 K, but this product does not go on the priority list because promotion has already been undertaken.

42. Alvenious Pipes

Owing to the great requirements for this pipe, conversations have been held between RCM and Hume (Zambia) Ltd. of Luanshya.

However, this society does not consider the investment of £ 0.5 million opportune.

The importance of the market for 1,500,000 K by 1980 would appear to require a deeper study of the problem.

It goes on the list of priorities.

43. PVC Plastic Rigid Tubes

Steel Co. of Zambia Ltd. of Lusaka (Plastics Division) can manufacture products locally which up to now were imported, and at a price much lower than that of the Padley and Venables products, but no reliable information has been obtained as to present demand.

For example, they can produce:

U.P.V.C. Rigid Pipe/Tube, 1/2" to 12" in diameter

U.P.V.C. Electrical Conduit, 20 mm to 25 mm in diameter

U.P.V.C. Sewer Pipe, 110 mm to 160 mm in diameter.

5. ELECTRICAL COMPONENTS

51. Electric Motors

The amount of imports and their diversity do not justify their manufacture.

52. Transformers

Medium transformers are already been made in Zamgia and this plant has its own expansion plans.

53. Electric Material

Through the study conducted, it has been verified that all electrical material except for some cables, transformers, and distribution panels are imported.

However, this is such an important and diversified chapter, for in addition to its use in industry it is also necessary in housing construction, that it would warrant a study to see what manufactures may be undertaken in the country.

54. Resistances/Electric Locomotives

Samples made by Scaw and tests conducted by Matl Test Department (Kalulushi) demonstrate that this material, in spite of the high degree of quality control required, can be made locally, but no reliable information has been obtained as to demand for these products.

55. Electric Light Bulbs

Philips has conducted studies on their manufacture in Zambia and has rejected the possibility as uneconomical.

56. Cells and Batteries

The present demand is insuficcient to undertake these manufactures.

6. ASSEMBLED COMPONENTS

61. Assembled Steel

The demand for assembled steel in the country is sufficiently great to encourage its manufacture in the already existing industries.

Annual production capacity is very low compared to requirements which will be 12, 500 t by 1980.

It goes on the list of priorities.

62. Containers

In the future, forecasts will have to be made to see the possibilities of making containers for the Lusaka-Dar-es-Salaam rail road.

Lenco has installations which can be used for this type of manufacture.

63. Wire Products

Only special wire rope is imported.

Lenco of Lusaka manufactures nails.

Copperbelt Steel Manufacturing Company manufactures wire mesh for grilles.

A.W. construction of Kitwe makes slings.

64. Nuts and Bolts

Short runs are made in small shops.

Nevertheless, demand in the country warrants studying the problem in depth.

The companies to which RCM has submitted this matter are not interested because of the capital requirements.

It goes on the list of priorities with consumption requirements of 3,300 t by 1980.

65. Nut-Hex Standard (Large)

Gilmer Engineering Co., Luanshya has demonstrated interest in the manufacture of 1 1/8" and 3" diameter and has made the molds appropriate for cold forging manufacture.

66. Roof Bolts-Expansion Shells/Studs

Selco-Kitwe has a workshop for producing screwed studs and expansion shell components.

They are capable of extending to other manufactures, but their prices are higher than those of R.S.A.

67. Hand Tools

Requirement figures for the country warrant a study concerning the installation of a new plant.

It goes on the list of priorities.

Imports forecast for 1980: 3,500,000 K.

68. Chains

Only one type (3/8") is produced in the country, and this production has made possible a notable reduction in imports. The manufacturing company has excess capacity.

The manufacture of the remaining types is not economical. Besides, their imports are very limited.

69. Conveyor Idlers

The manufacture of conveyor idlers in Zambia has been undertaken by SKF, based on drawings from Hewitt Robins.

Present prices compared to those imported from RSA are:

H.R. Style 250 DS	+ 8%
H.R. Style 251 DS	-11%
H.R. 1295 M.M. Std.	-28%

In the installation that SKF has in Kitwe, they can produce 80,000 idler rollers per year.

They can also make impact/training idlers in conjunction with Pigott Maskew.

In conjunction with other shops they should begin to make pulleys with BS Standards/ISO norms.

The assembled steel part can also be made in the country. In this way, a large proportion of the conveyors would be locally manufactured.

It would be most opportune if all the mines would standardize their consumption in increasing the runs.

1. INTRODUCTION

70. Belt Fasteners

RCM negotiated with Copperbelt Forging Co., Mufulira which, for the moment, is not interested in the extension or diversification of its products.

71. Air Cylinders (Pneumatic)

Lenco of Luanshya already has installations and is willing to make complementary investments to meet the demand.

72. Rock Drill Spares

Supply requirements for these articles are very important in the country.

Diacarb in Ndola is already making certain products. Nevertheless, Diacarb's production should be greatly increased.

It goes on the list of priorities.

Requirements by 1980: 4,050,000 K.

73. Diamond Bits and Crowns

Practically the majority of the requirements are made in the country. Nevertheless, there have been imports in spite of the sufficiency of manufactures.

74. Gyrex Screening

The supply of local products is more expensive than Grennings (R.S.A.). No orders have been placed with local industry.

75. Open Mesh/Grid Flooring

There is local manufacture at present sufficient to avoid imports.

76. Power Generation Machinery

Refer to nº 80.

77. Agricultural Machinery

Refer to nº 80.

78. Machine Tools

Refer to nº 80.

79. Machines for Mining and Construction

Refer to nº 80.

80. Machinery and Machine Parts

An estimate of the demand for 1980 yields 19,850 t and 68.9 MK in value. These figures are really important and warrant the manufacture of spare parts for this machinery.

Therefore, it goes on the list of priorities.

81. Pumps and Valves

The consumption of valves and complete pumps and their spare parts, among which are impellers, is very important.

At the present time, everything is imported, and requirements for 1980 will reach 3,625 t for all types.

It is considered to be an interesting manufacture to be introduced into the country because of its high consumption.

Nevertheless, it must be pointed out that since they are of many types and ratings, standardization is totally

necessary for the purpose of attaining profitability in their manufacture.

It goes on the list of priorities.

82. Impellers

In reality, these products are included in the preceding chapter. However, because of their importance and the fact that they will be manufactured at a different installation (bronze foundry), it is necessary to differentiate them.

In the visit to the shops of the mining facilities, the large stock of bronze impellers for spares was noted.

These parts are not manufactured in country. Requirements for 1980 amount to 950,000 t.

It goes on the list of priorities.

83. Gears

The import figures for machinery that have been grouped together in nº 80 are really significant.

The gear is a very important element among spare parts.

It is not possible to estimate the value of gears needed to be used as spares or in future installations.

Nevertheless, compared with the value of imported machinery, manufacturing 750,000 K by 1980 is considered a prudent estimate.

It goes on the list of priorities.

84. Moulds, Dies

Faced with the number of industries needing moulds and dies, it is necessary to plan making them in the country.

Dependence on outside sources limits manufacturing possibilities in many cases.

At the present time, imports attain 300,000 K/year, but this figure must be multiplied when the manufacturing sector os the country is developed.

It goes on the list of priorities.

85. Components 150 RB Shovel/BE 40 Drill

Although conversations were initiated in early 1975 concerning the manufacture of these components, and the Material Testing Department (Kalulushi) determined the specifications of the materials, no decision had been reached in Nov. 1975.

86. Components Gyratory Crusher

This is in the same situation as the preceding item.

87. Main Frames - Symons Crusher

In Rhokana Division (NCCM), a machine tool is being installed for machining these bodies.

88. Loco/Rolling Stock - Wheels/Axles

Local manufacture of these items was undertaken several years ago. The country is thus self-sufficient and could export to neighbouring countries.

89. Railway Vans, Wagons, and Trucks

Not considered because the present situation of exterior transport not enable one to make forecasts.

9. OTHERS

91. Moulds Wash

Mould wash can be made in the country with raw materials imported by Zambia Refractories.

92. Refractories

This is a very important chapter among imports.

Refractory bricks are not produced in the country. For this reason a factory will have to be installed based on imported raw materials.

It goes on the list of priorities with a forecast of 10,580 t consumption of basic refractories by 1980 (9,900 t by mining industries) 500 t by cement industries and 180 t by foundries).

93. Refractory Supplies - Cements

Cullinan Refractories can make these products from imported raw material.

It is advisable to see the real capacity for manufacturing these products in country before importing them.

94. Heat Insulating Bricks

The scant number of imports, table 4.34, does not warrant devoting more attention to this chapter and no forecasts are made.

95. Grinding Wheels

The same commentary as in the preceding paragraph (table 4.35).

96. Explosives

They are made in country in the Kafironda Limited explosives factory in Mufulira.

There is much importation of accessories and 1,500,000 K is the estimated figure by the year 1980.

One should study whether or not it is feasible to make these accessories in country, but this is not an objective of this study.

5.2.2. Priority List

	Code
- Metallic Products	
Wire Bar Cores	13
- Casting Products	
Pump Castings	21
Non Ferrous Metals Cast	22
Junction Boxes	23
Brake Shoes-Loco/Rolling Stock	24
Balls	26
Liners	27
Cylpebs	28
Hollow Screw Clamps	29

5.3. PROJECT ASSIGNMENT

Existing Companies	Products	
FOUNDRY ENGINEERING, LUANSHYA	Wire Bar Cores	13
	Pump Castings	21
	Non Ferrous Castings	22
	Hollow Screw Clamps	29
	Impeller Castings	82
VULCAN FOUNDRY, LUSAKA	Junction Boxes	23
	Brake Shoes	24
SCAW LTD., KITWE	Balls	26
	Liners	27
	Cylpebs	28
PIGOTT MASKEW, KITWE	Retrading of Tyres	32
	Pump Components	34
HUME, KITWE	Alvenious Pipes	42
ROAN ENGINEERING, LUANSHYA	Assembled Steel	61
COPPERBELT STEEL MANUFACTURING CO. LTD, KITWE	Assembled Steel	61
DIACARB, NDOLA	Nuts and Bolts	64
	Rock Drill Spares	72
New Factories		
1. REFRACTORY FACTORY	Refractories	92
2. METAL COMPLEX		
2.1. FOUNDRY AND MACHINE SHOPS	Machinery and Machines Parts	80
	Pumps and Valves	81
	Impellers	82
	Gears	83
	Moulds and Dies	84
2.2. HAND TOOLS SHOP	Hand Tools	67

5.4. REORGANIZATION, TRANSFORMATION AND EXPANSION OF PRESENT INSTALLATIONS

5.4.1. General Considerations

The proposed expansion program should be studied by the enterprises in accordance with section 7. With an Action Plan, an agreement can be reached between Government, the Manufacturing Enterprise, and the Mining Companies.

This plan should define:

On the part of the manufacturer	Proposed production
	Plans to achieve it
	Necessary investment
	Requirements for specialized personnel
	Raw material requirements
	Technical studies for expansion
	Economic study
On the part of the mining company	Products to be made
	Quantities
	Plans
	Prices
On the part of the Government	Advantages granted the project
	Controls and guarantees for its accomplishment

Hereafter follows a summary listing of possible projects that can be undertaken by already existing industries, by reorganizing, enlarging, or transforming their facilities.

5.4.2. Foundry and Engineering Co. Ltd., Luanshya

		Code
Manufactures:	Wire Bar Cores	13
	Pump Castings	21
	Non Ferrous Cast	22
	Hollow Screw Clamps	29
	Impellers/Cast	82

Foundry and Engineering is the only non dependent bronze foundry operating in the country.

At the present time, it is a foundry of limited means, but it is capable of modernizing improvements through new investments and the contracting of technical personnel to attain the necessary level of quality.

The work program proposed is sufficientty broad to multiply their present production several times.

In this particular case, since the country has copper and zinc, the basic components of brass, the value added in country is significant. Tin needed for bronze ist imported.

The parts that need machining would be finished in the new machine shop proposed.

5.4.3. Vulcan Foundry, Ltd., Lusaka

		Code
Manufactures:	Junction Boxes	23 aluminium
	Brake Shoes	24 cast iron

The numerous parts cast in this material that the mining company has can be made in the aluminium foundry.

The present report in two volumes (Memorandum and Annexes) is in response to a contract feasibility study for the manufacture of mining equipment in Zambia (UNIDO Contract nº 75/37, Project nº IS/ZAM/74/020).

The objectives of the study are as follows:

a) Investigate and establish the pre-feasibility of manufacturing and/or assembling in the Project Area mining equipment as well as spare parts for such equipment, with the maximum use of raw materials, labour, experience and enterprises existing and/or to be created in the Project Area, in order to minimise the value of imports of such equipment and spare parts.

b) Prepare, on the basis of the results of the investigations referred to in sub-paragraph a) hereinbefore, the terms of reference for the second phase of the Project, i.e. for a complete technical and economic feasibility study.

In order to compile the informations needed to fulfil the proposed objectives, a questionnaire was prepared and sent to those institutions concerned in Zambia. Later, a Tecniberia three member team went to Zambia and stayed there for a month.

The usefulness of the questionnaire has been very limited, since only a small number of important companies received it, and even fewer answered in the manner and time limit desired.

The direct survey conducted by the team has been very useful, especially from a qualitative point of view. The same cannot be said for the quantitative information compiled which, although of great intrinsic interest, scarcely permits systematic technical treatment

These parts will be machined in the new machine shop.

Relations between Vulcan Foundry and the mining industry have been rather limited.

The iron foundry has a group of machine installations from which they are getting little output.

The causes are: The low quality of the iron cast in the cupola because of the lack of pig iron and the disintegration of coke during the long period of transport from the countries in which it is bought.

- They have no technical personnel
- They have no pattern shop for performing varied jobs.
- They have no laboratory.

Nevertheless, there is a very usable facility base that can be completed with an induction furnace which will eliminate the problem of pig iron and coke.

5.4.4. <u>Scaw Ltd., Kitwe</u>

		Code
Manufactures:	Balls	26
	Liners	27
	Cylpebs	28

Scaw has adequate facilities for accomplishing the indicated program.

It would be appropriate to install a quantometer for obtaining rapid analyses.

The program equals an increase of 2,020 t annually in special castings.

They have no difficulty in making the liners, since they make more important quantities for the mining industry.

They also manufacture 30,000 t of grinding balls, although those requested here, which are the kind now in use in the cement factories, are of a different quality.

These balls can be made in the present facilities. All they need is a manufacturing license, in case they cannot be substituted by those presently made by Scaw.

Cylpebs can be cast and a manufacturing license can be sought for this purpose.

Scaw lists the following difficulties:

- Lack of technical personnel
- Lack of raw materials.

5.4.5. <u>Pigott & Maskew, Kitwe</u>

		Code
Manufactures:	Retreading of Tyres	32
	Pump Components	34

Tyre retreading for the loading shovels can be done with an annual import saving of 1,000,000 K.

This factory is capable of attending to a large number of rubber products that the mines presently import.

The difficulty may be in the fact that the runs are not profitable.

The mining industry should make up the list of different parts.

They can also rubberize machined elements when the new workshop can provide the necessary guarantee of quality.

This factory has technical assistance of General Tyres at its disposal and can therefore develop many manufactures.

5.4.6. Hume, Kitwe

	Code
Alvenious Pipes	42

The mining industry has already proposed that Hume manufacture this kind of pipe.

Nevertheless, Hume has rejected the proposal because of the investment necessary.

Considering the high consumption which presupposes a great saving annually in foreign exchange for the country, it would be appropriate to conduct a study based on a concerted action with the Government which would provide the advantages pointed out in section 7.

Otherwise, the problem could be proposed to Steel Company of Zambia in Lusaka, manufacturers of welded steel pipe.

5.4.7. Roan Engineering, Luanshya
Copperbelt Steel Manufacturing Co., Ltd., Kitwe

	Code
Assembled Steel	61

Assembled steel requirements are really very high.

These two companies already work for the mining industry, but they can be further developed to do much more important jobs.

A technical office will have to be formed to study the manufacture in country of mining equipment based on plans

submitted by foreign companies or by the mining industries themselves.

In this manner a large volume of imports would be avoided.

These two proposed companies already have a basis for undertaking these manufactures.

The mining companies should request permission from the foreign firms supplying their equipment, for their new installations to manufacture a certain percentage of their supplies within Zambia, subject to an agreement for cooperation and technical assistance.

5.4.8. Diacarb, Ndola

	Code
Nuts and Bolts	64
Rock Drill Spares	72

Nuts and bolts are made in country by small firms with modest facilities.

Nevertheless, consumption in country is significant, not only in the mining industry but also in other sectors. Because of its technical structure, Diacarb could serve as a base for this production.

Diacarb is a company that specializes in the large scale manufacture of high quality parts for drilling machines.

Because of this, it is in a position to extend this production whose consumption is really important in mining. Nevertheless, for them to extend their line of products would mean colliding with the interests of the manufacturers of the

machinery who wish to export the replacement parts from their respective countries.

Nevertheless, a Government program could consist in limiting the number of makes or brands, making import concessions based on the manufacture of a certain percent of the spare parts in country. Diacarb is an excellent base for these types of manufactures.

5.5. GENERAL DESCRIPTION AND DATA OF THE NEW PLANTS SELECTED

5.5.1. Factory for Basic Refractories

5.5.1.1. Introduction

In Zambia there is no refractory plant and only refractory cement is prepared in the Cullinan installation at Kitwe.

In Zambia, chromium magnesite refractories are used in different melting furnaces, refining, and wire bar casting in copper metallurgy. Magnesite refractories are used in the cement industry, foundries, etc.

Since the consumption of chromium magnesite refractories is located in the Copperbelt, the plant would be situated in that area where there is, moreover, an adequate infrastructure.

5.5.1.2. Technical Specifications

The plant will produce 6,000 t/y of basic refractories, but its enlargement to 10,000 t/y would be planned.

This latter is the figure deemed possible of attainment by 1985.

Chromium magnesite bricks will be destined for use in copper metallurgy and may contain from 40% to 90% Mg.

The different types can be: Chemically Bonded, Burned or Direct Bonde.

Considering the use to wich the products will be put their quality will have to be of the highest. For this reason, an associate of international standing must be sought.

5.5.1.3. Raw Materials

The raw materials are:

Periclase, a magnesium oxide obtained from sea water. The producing countries are England, USA, Italy, Japan, Mexico, etc.

Magnesite: by calcination of natural oxides. High quality magnesites can be obtained in Austria, Greece, Yugoslavia.

Chromium: Phillipines, South African Republic.

5.5.1.4. Description of the Manufacturing Process and List of the Principal Machinery

The fabrication process is simple and is the same as for all refractories.

To make different qualities, they vary the raw materials, cooking cycles and type of agglomerate.

The plant will consist of the following sections:

- Raw materials yard, with possible rail access for unloading imported raw materials.
- Grinding.
  Two grain grinders for chromite and periclase. Two ball grinders with screening systems for impalpables and for the elements themselves.
- Screening, weighing, and mixing installation. Mixing is done in the mixer which is fed by a dosing unit.
- Presses
  Pressing in automatic presses is for large series, since two operators produce 25 t in eight hours. Four regular presses of over 1,000 t will be used here which will produce four t each in eight hours with one operator.

Annual production capacity with four presses working two shifts daily is 8,000 t/year. There is an excess capacity of 33% to cover stoppages, changes, and breakdowns.

- Tarring and tempering installations.

- Chamber kiln.

  Three chamber furnaces are recommended which can work intermittently with flexible cycles and temperatures. It is preferible for the kiln to be gas fired, but given the situation in Zambia, it could operate on light diesel fuel.

  The cycles are from three to four days and the load from 20 to 30 t; thus, each furnace has a maximum capacity of 300 t/month.

- Control laboratory, Chemical analyses and X-rays.
- Packing and shipping.
- Mechanical maintenance shop.
- Die maintenance shop.
- Auxiliary services.: electricity, water, air, fuels, etc.
- Offices.
- Warehouses.

5.5.1.5. <u>Technical Data</u>

Building: 6,000 m^2 covered
Electric energy: 800 KVA

5.5.1.6. <u>Labor Force</u>

Personnel necessary: 70 persons
Staff personnel should be as follows:
1 Manager
1 Technical Director

1 Chief of Production

1 Laboratory Chief

1 Chief of Maintenance

In the beginning, the associate foreign firm providing the know-how will give the necessary assistance in personnel training.

5.5.1.7. Know-how

Know-how should be provided by a manufacturer of high standing in the world market.

This manufacturer should participate in the installation, start up, and later operation.

5.5.1.8. Economic Data

Prices

The cost of raw material in the international market varies between 0.09 and 0.12 K per kg.

The internal sale price of these refractories in the producer countries varies from 0.24 to 0.36 K/kg.

Nevertheles, in Zambia one must expect some additional costs due to transport and customs. Therefore, the sale price will vary between 0.40 and 0.60 K/kg.

Manufacturing Costs

As for international costs, the prices of raw materials will be higher in Zambia, as well as other production costs.

A cost breakdown would be:

Raw materials	57%
Labor	12%
Other production costs	13%
General costs	4%
Amortisation	14%
	100%

Gross profit will be 20% of sales.

Annual invoicing 3 MK.

Investment 3.5 MK.

The report herewith presented consists of volume I with seven sections and volume II with three annexes. The first section is taken up by the present introduction. The second is devoted to conclusions and recommendations. In the third, the general information considered of interest. In the fourth part, demand for the products that are the object of this study is analyzed, and the possibilities of manufacturing them in Zambia are evaluated. In the fifth section, priorities are established, the availability of resources is studied, and, finally, the construction of new plants and the expansion of other already existing ones are proposed. In the sixth section, the terms of reference pertaining to the feasibility studies of the new plants whose construction is proposed are included. The seventh section presents a general plan of action. Finally, the annexes contain tables, and technical data on the firms visited. With respect to these annexes, it is necessary to point out that they contain the information available, useful to the objectives of the present study, and some data that could be of interest for later studies.

The numbering of the tables in the annex corresponds with that of the section in which they are cited, an independent order having been established for the tables of each section.

Finally, all economic data are presented in Kwachas. The official rate of exchange in Zambia during the stay of the Tecniberia team was 1 U.S. $ = 0.6430 Kwacha.

5.5.2. Foundry and Machine Shops

5.5.2.1. Introduction

Among the production lines selected in the present study are the manufactures of:

Spare Parts: mainly assigned to the mining industry of copper.
Gears: for the industry in general.
Pumps and valves: complete equipments and its parts to be fabricated with licence.
Impellers: for the pumps.
Dies and moulds: for the industry in general.

All these fabrications may be realized in one factory which would have the following divisions:

- Technical Division
- Iron and steel jobbing foundry
- General machine shop
- Gears shop

The mechanisation of spare parts, pumps and valves, impellers, dies and moulds will be made in the general machine shop.

The gears workshop will make gears only. The technical division common to the whole factory has for its objective the preparation of the specifications for the different manufactures and consists of:

Technical office: Drafting
Work preparation
Metroloty Department

Laboratory: Chemical

Spectrografic

Mechanical tests

Metalographic

Molding sands

Heat treatments

5.5.2.2. Coordination between the Foundry and Machine Shop and the Mining Companies

The number of parts utilized by the mining companies is very high. It is therefore necessary to select those pieces to be made in ths factory. For this purpose, a mixed commission should be constituted represented by this part and the mining companies and supervised by the Ministry of Industry and Mines.

The factory has the necessary technical departments in order to make drawings and determine the specifications of the parts.

In view of these data and of consumption, the aforementioned commission will decide on the possibility of producing each of the parts.

5.5.2.3. Iron and Steel Jobbing Foundry

5.5.2.3.1. Technical Specifications

Qualities to be produced are: Plain, high resistant and alloy cast iron. Ductile iron. Carbon and alloy steel.
Initial capacities will be:
Iron 150 t/month
Steel 30 t/month

5.5.2.3.2. Raw Materials

Raw materials conetitute a major problem for this plant, since there is no pig iron, coke, iron alloys, or bentonite.

Therefore, it is recommended to do without pig iron and coke and to work with scrap iron coming mostly from cars and trucks, as well as with a large proportion of scrap steel.

Because of the needs of the company, there will not be a sufficient quantity of the latter. It will therefore be necessary to import it, if possible from the countries bordering on Zambia such as Zaire and Tanzania.

As for sands, at the present time, there are no washed sande in Zambia, but natural sands can be utilized as Scaw is doing.

Bentonite and iron alloys have to be imported.

5.5.2.3.3. Process and Installations

To obtain cast iron, starting with scrap, a crisol low frecuency induction furnace is used which allows the making of synthetic cast iron from steel and iron scrap, adding carbon in the form of graphite.

This furnace does not need coke since fusion is electric and, although the inveetment is greater, operating cost is considerably lower, bearing in mind the price of raw materials in Zambia.

To obtain steel, a medium frequency induction furnace would be ueed which would enable the production of more varied typee.

For ductile cast iron, either of these two furnaces may be used.

Considering the variety of qualities to be produced, a good laboratory equipped with a system of rapid analysis such as a direct reading spectrographic unit is required.

There are joint installations for both productions of iron and steel and other specific ones for each one of them:

- Scrap yard
- Pattern and pattern plate shop
- Smelting house:
  Iron furnace
  Steel furnace
- Foundry sand installation:
  For iron
  For steel
- Core shop
- Molding sections for iron and for steel:
  Molding loose pieces with a sandslinger
  Molding pieces by machine in limited quantities
- Cleaning:
  Head cutting
  Shot blasting
  Grinding and fettling
  Welding
- Heat treatment
- Laboratory:
  Chemical analysis

Spectrographic analysis

Sand testing

Metalography

Mechanical tests

- Internal transport
- Maintenance
- General services:

  Compressed air

  Water

  Electricity

  Fuels

- Technical Office
- General Offices
- Warehouses
- Shipping

5.5.2.3.4. Technical Data

- Building: 4,000 m^2
- Electric Power: 1,200 KVA
- Production: 1,500 t/year of iron; 300 t/year of steel.

5.5.2.4. General Machine Shop

5.5.2.4.1. Technical Specifications

The parts to be manufactured will be of small and medium size, the top limit being 100 kg, although at times this limit may be exceeded if the form and the installed machinery will allow.

Initial capacity will be 200 t/month of parts.

5.5.2.4.2. Raw Materials

Beginning materials will be:

Pieces cast in iron, steel, bronze, and aluminium.

Forged work

Laminated products.

5.5.2.4.3. Description of the Shop and List of the Principal Machines

The shop will consist of the following sections:

- Materials warehouse
- Heavy machine shop
- Light machine shop
- Thermal treatment shop
- Fitters shop
- Tool preparation shop
- Control department
- Maintenance shop
- General services, electricity, water, fuels, compressed air
- Technical office
- General office
- Finished products and shipping warehouse.

A sampling of the machines follows:

Lathe Section

4 Semi-heavy turret lathes

3 Vertical lathes

1 Vertical lathe with tracer

4 Semi-heavy horizontal lathes

1 Horizontal lathe with tracer

8 Light lathes

Milling Machine Section

4 Universal milling machines

3 Vertical milling machines

2 Horizontal milling machines

2 Boring machines

Grinding Machines

1 Universal and interiors grinder

1 Level grinder

Miscellaneous

3 Planers

3 Post drills

2 Radial drills

Machine Shop

Strip soldering machine

Tool sharpener

Universal milling cutter sharpener

Bit sharpener

Thermal Treatments

Muffle furnaces for hardening and tempering

Cementation furnace

Auxiliary Machinery

Metrology shop

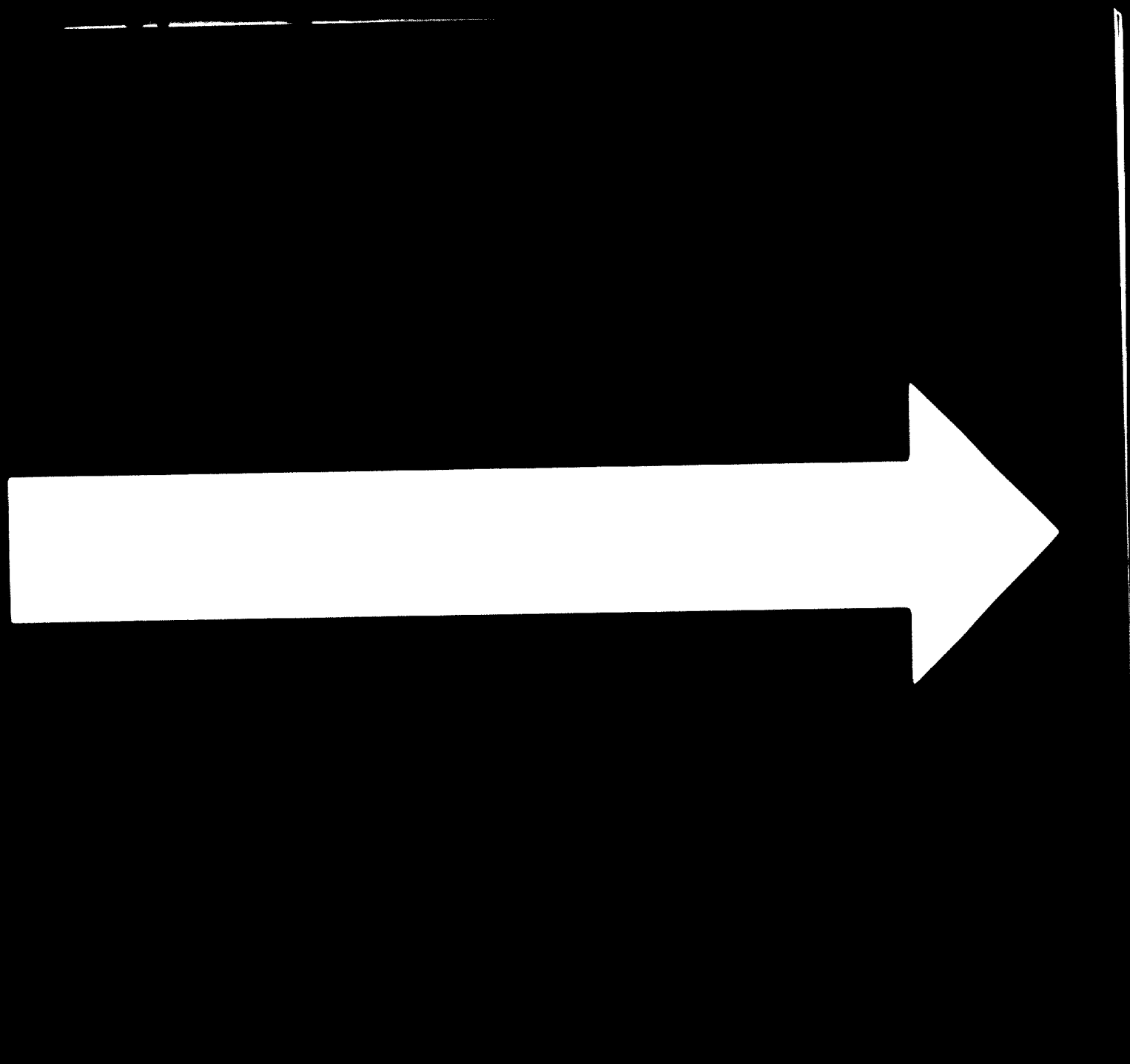
Fitter's shop

2 Forklifts

250 kg hoist for every two medium machines

Overhead cranes in the shops

G-899



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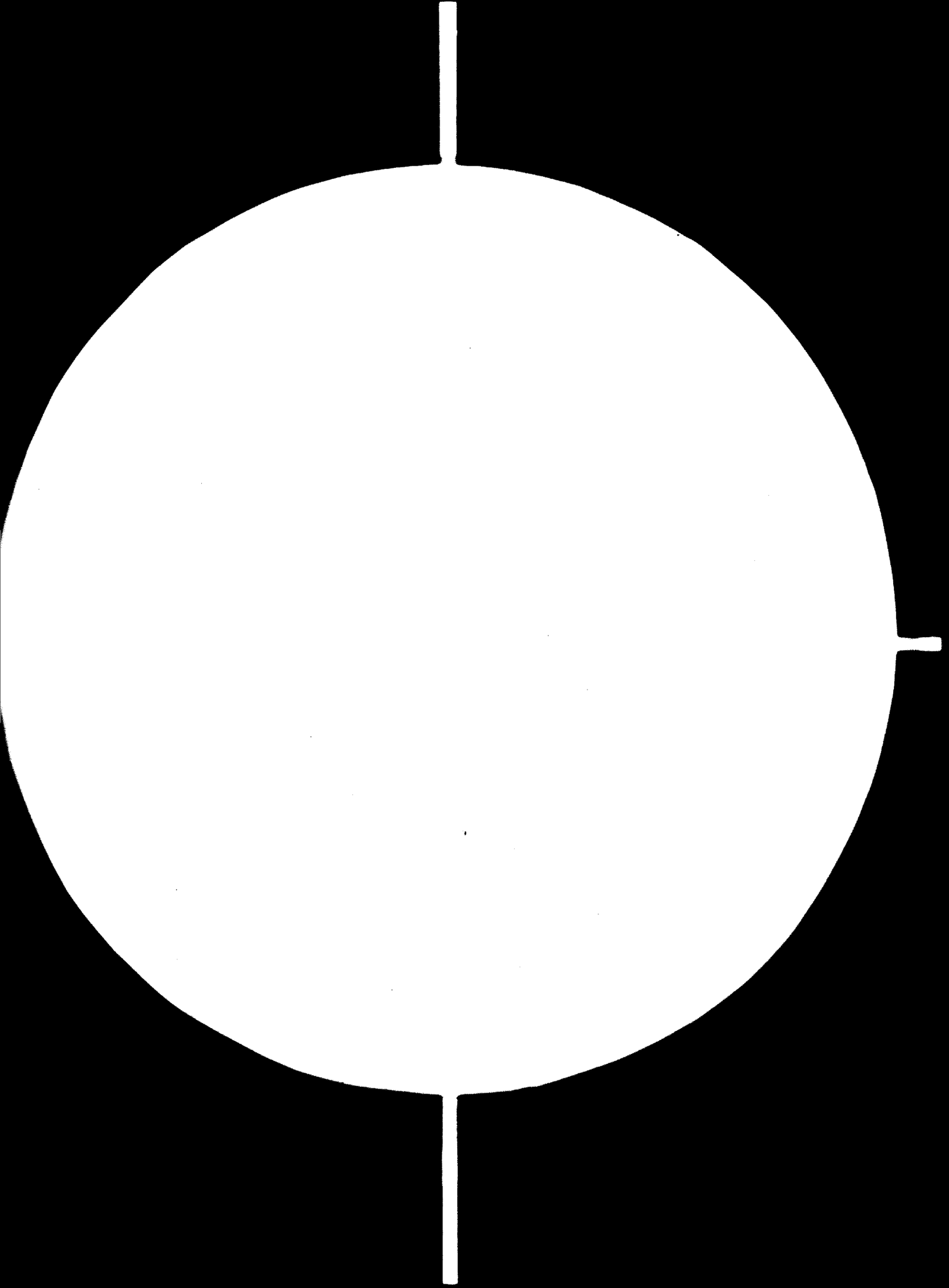

5.5.3.5. Technical Data

Building: 4,000 m^2

Installed Power: 500 KVA.

5.5.3.6. Work Force

Total: 100 persons, distributed as follows:

- Drop forging	30
- Finishing	15
- Tool shop	20
- Dies	10
- Carpentry shop and assembly	5
- Auxiliary services	10
- Offices and management	10
Total	100

5.5.3.7. Know-how

Necessary know how should be provided by a company capable of training the Zambian personnel and of sending sufficient technical personnel during the first years of operation.

5.5.3.8. Economic Data

- Annual invoicing: 1.2 MK/year
- Cost price: the percentage cost distribution is estimate as follows:

Raw material	30%
Labor	30%
Other production costs	20%
General expenses	8%
Amortization	12%
	100%

- Profit: A profit of 20% above invoicing would be advisable
- Investment: 1.2 MK.

6. TERMS OF REFERENCE

6.1. PRIOR OBSERVATIONS

The terms of reference for the feasibility studies for the plants considered in section 5.5, follow in the same order.

Foundry-Machine Shops and Hand Tool Plant are treated as separate studies and, for that reason, independent terms of reference have been prepared. Possibly, under conditions existing in Zambia, it would be useful to study those plants jointly as a Metal Complex. This option is left open.

6.2. FACTORY FOR BASIC REFRACTORIES

A. Background information

The manufacturing sector has been one of the most dynamic sectors of the economy of Zambia ever since independence. It merited special government attention in the development plans; the Second National Development Plan is presently in effect (1972-76). In spite of the preceding, a study carried out by UNIDO with the agreement of the Government of Zambia in 1975/76 detected the existence of various product lines that can be manufactured in the country. Nevertheless, they are practically all imported.

One of these is refractpry bricks, and more specifically those made of a magnesite and a chromium magnesite base. It is not worth considering the other types at this time because of the relatively low quantities of each quality and type that are consumed at present. On the other hand, refractory bricks of a chromium magnesite base have a high consumption and are much used in copper metallurgy. Magnesite refractories are used in the cement industry, foundries, etc. in Zambia.

The copper industry (mining, metallurgy and electrolysis), situated in the Copperbelt Province, is the basis of the country's economy and guarantees a consumption of these refractory bricks in sufficient series to justify the construction of a plant in Zambia for their manufacture. Moreover, economic crises apart, the Zambia copper industry has set as its longterm goal, an average annual growth rate of 2.5%.

Given the present import figures and the proportion estimated replaceable by local production, the present consumption by the copper industry, and its long-term objectives, using 1980 as the target year, it is considered possible to manufacture a minimum of 6,000 tons/year of magnesite and chromium magnesite refractory bricks and probably 10,000 tons/year.

With a 1985 target data, this latter figure appears clearly viable.

Consequently, it has been decided to conduct a feasibility study of a plant devoted to these manufactures. Details of this follow. Nevertheless, the possibilities of producing refractory cements should also be explored.

B. Objectives of the project

1. Inmediate objectives

To prepare a feasibility study of a new plant for the manufacture of basic refractories in Zambia.

2. Long range objectives

a) To replace the import of magnesite and chromium magnesite refractories, producing the maximum number possible in the country within a previously set plan, increasing the amount of local transformations.

b) Although, as of now, raw materials for this manufacture have not yet been discovered in Zambia, they are trying to promote maximum utilization of the remaining local resources and in particular to make use of the available manpower and contribute to their training.

c) To diversify local industry, to promote the technological development of Zambia, as well as the engineering firms of the country.

d) To promote Zambian exports, both for the purpose of obtaining modern plants of increasingly competitive size, as well as diversifying the country's exports, thus reducing its dependence on a limited number of products.

C. The Scope of Contracting Services

1. General outline

a) The study will contain Data Analysis on refractories to be produced and a program for the incorporation of successive manufactures, in case it is advisable to proceed by phases.

b) Recommendations and specifications on process, equipment, layout, etc. for use by the Ministry of Mining and Industry in calling for tenders for construction of the plant, should this be decided.

c) Analysis and recommendations on the various options available to Zambia for obtaining finance and know-how, from both domestic and international sources.

2. Scope of work

The following studies will be carried out:

a) Situation of the markect

i) The study will cover a detailed analysis of the domestic market for refractories, focusing on the copper industry, for the selection of qualities and

dimensions to produce in the successive stages of the plant, giving priority to those types that are easier to produce and which have greater importance because of their import volume.

ii) Possibilities for export to Zaire will be studied.

iii) Present prices in the internal market will be compared with those currently in effect in the producing countries. The possible savings in foreign exchange in the different stages will be evaluated.

iv) A plan for substituting the importation of basic refractories will be proposed, to be agreed upon by the Government of Zambia, the manufacturing plant and the local consumers, specifying a timetable, quantities, incentives and profits, etc.

b) **Feasibility study**

Based on the conclusion obtained from the market study, the feasibility study will include:

i) Previous decision

Minimum capacity of the plant, both from a technical and economic point of view.

Appropriate and alternative production processes.

Location of the installation.

Maximization of the parts of the plant to be built and assembled in Zambia and the contribution of local engineering firms.

ii) General plans of the plant with the approximate location of the machinery.

iii) Basic specifications and list of equipment and spare parts for the following sections:
Warehouses for raw material.
Grinding and screening.
Dosification.
Mixing.
Pressing.
Tarring.
Furnaces
Laboratory and production control.
Packing.
Warehouse for finished products.
Shipping.
Die shop.
Maintenance shop.
Technical and general offices.
General services.

iv) Basic specifications for engineering services:
Building.
Electric power.
Water.
Fuels.
Compressed air.

v) Installation planning.

vi) Management and personnel.
Management needs, with process and market experience.

Staff requirements.

Technical personnel.

Workmen.

Training program envisaged.

vii) Economic analysis.

Investments.

Capital and financing.

Cost of manufacturing.

Break Even Point.

Investment Return.

Cash-flow.

viii) Concept of the venture.

Government's role in promoting the venture.

Selection of partners for the joint venture.

Equity participation.

Selection of suitable partners for management and consulting contracts.

6.3. FOUNDRY AND MACHINE SHOPS

A. Background Information

The manufacturing sector has been one of the most dynamic sectors of the economy of Zambia ever since independence. It merited special government attention in the development plans; the Second National Development Plan is presently in effect (1972-76). In spite of the preceding, a study carried out by UNIDO with the agreement of the Government of Zambia in 1975/76 detected the existence of various product lines that can be manufactured in the country. Nevertheless, they are practically all imported.

This is the general rule as far as cast and machined parts (montly spares) are concerned, whose principal consumers are the mining industries. The majority of these parts will certainly have to continue to be imported, but Zambia is certainly capable of undertaking successfully the production of the rest.

There are two foundries in Zambia. One of them, well equipped, is working at full capacity and covers a different field from the one planned for the plant that is presently under consideration.

The other foundry lacks good tooling and qualified personnel, and has very limited means for making the variety and quality of pieces being considered.

The products to be obtained in the planned foundry and machine shops will be mainly:

Spare parts: They are machined parts, in general weighing up to 100 kg in plain, high resistant, and alloy cast iron, ductile

5.5.2.4.4. Technical Data

Building: 3,000 m^2

Installed power: 450 KVA.

5.5.2.5. Gears Shop

5.5.2.5.1. Technical Specifications

The purpose of the gear shop is the mechanisation and thermal treatment of spur gears, helical gears, conical gears and others.

The largest module will be 12.

5.5.2.5.2. Raw Materials

Qualities:

- Carbon and alloy steels.
- Cast steel and perlitic cast iron and nodular cast iron.
- Bronze.

Forms:

- Rolled steel, up to 200 mm ϕ.
- Forged bars for diameters greater than 200 mm.

5.5.2.5.3. Shop Sections and List of Machinery

The shop will have:

- Materials warehouse
- Machine shop
- Treatment shop
- Checking and metrology
- Auxiliary services
- Technical and administrative office
- General warehouse and shipping.

iron, and carbon and alloy steel.

Pumps and valves: Complete equipments and its parts, particularly impellers.

Gears

Dies and moulds: For the present plant and for the industry in general.

The plant will consists of:

- Technical Division
- Iron and Steel Jobbing Foundry
- General Machine Shops
- Gears Shop.

The copper industry, the basis of the country's economy is located in the Copperbelt Province and is the principal consumer of parts such as those being considered. The mining companies import equipment, spare parts, consumer goods, etc., annually for an approximate value of 50 million K (about 80 million U.S. dollars at the official rate of exchange). However, the manufacturing sector in general, which has a certain importance in Zambia should not be forgotten.

The Copperbelt Province is the location planned for the plant and in the above mentioned study it was concluded that by 1980, a annual invoicing of 5 million K can be reached.

For all the foregoing reasons, it has been decided to conduct a feasibility study for a foundry and machine shop as detailed in the following sections.

Finally, before conducting the study under consideration, the Government and the mining companies will have drawn

up a preliminary list of possible manufactures, since the mining companies use a total of more than 350,000 different items annually, a part of which is related to the plant being planned.

B. Objectives of the Project

1. Inmediate Objectives

To conduct a feasibility study of a foundry and machine shop, for spare parts, pumps, valves, impellers, gears and dies and moulds.

2. Long Range Objectives

a) To substitute the import of machined parts, mostly spares, producing the maximum possible within the country according to a previously established plan, with its consequent effect on the balance of payments.

b) To attain increasing self-sufficiency, reducing dependence on foreign sources as far as essential spare parts for their principal industries are concerned, especially the copper industry.

c) To promote maximum utilization of local resources, especially of the available manpower, contributing to their professional training. In the present case, this can be particularly important as far as the making of dies is concerned.

d) To promote the development of local technology as well as of the local engineering firms.

e) To promote and diversify exports, reducing the present dependence on a limited number or products.

C. The Scope of Contracting Services

1. General Outline

a) The study will contain Data Analysis of spare parts, pumps, valves, impellers, gears, etc., to be made and a programme for their incorporation into succesive production.

b) Recommendation of various firms with which agreements may be reached for the manufacture under license of some types of pumps, valves, and impellers.

c) Recommendations and specifications concerning process, equipment, layout, etc., for the use of the Ministry of Mines and Industry in calling for tenders for construction of the plant, should this be decided.

d) Analysis and recommendations on the various options available to Zambia for obtaining finance and know-how from both domestic and international sources.

2. Scope of work

The following studies will be carried out:

a) Situation of the market

1) A detailed analysis of the market of spare parts, pumps, valves, impellers, gears, etc., for the copper industry in order to select those products to be made in the successive stages of the plant.

The possibilities of other consumer industries, will also be considered.

ii) Establishment of a priority and determination of those products that it would be most advantageous to start making right away, whether because of their ease of manufacture or their greater importance in import figures.

iii) Possibilities of export to neighbouring countries will be studied.

iv) Present prices in the domestic market will be compared with those currently in effect in the producing countries.

v) The possible savings in foreign exchange in the different stages will be evaluated.

vi) A plan for substituting imports will be proposed, to be agreed upon by the Government of Zambia, the manufacturing plant and the local consumers, specifying a timetable, quantities, incentives and profits, etc.

b) <u>Feasibility study</u>

Based on the conclusion obtained from the market study, the feasibility study will include:

i) Previous decisions.

Minimum capacity of the plant, both from a technical and economic point of view.
Appropriate and alternative production processes.
Location of the installation.
Maximization of the parts of the plant to be built and assembled in Zambia and the contribution of local engineering firms.

ii) General plans of the plant with the approximate location of the machinery.

iii) Basic specifications and list of equipment and spare parts for the following sections:

- Technical Division

  Technical office

  Metrology department

  Laboratory (chemical, spectrographic, metalographic, mechanical tests, molding sands, etc.)

  Control and checking.

- Iron and Steel Jobbing Foundry (including dies and moulds for the industry in general)

  Scrap yard.

  Pattern and pattern plate shop.

  Melting Department.

  Induction furnaces for iron and steel.

  Foundry sand installations, for iron and steel.

  Core shop.

  Molding sections for iron and steel.

  Cleaning shop.

  Heat treatment.

  Internal transport.

  Warehouses.

- General Machine Shop and Gears Shop

  Materials warehouses.

  Shop for large machinery.

  Engineering shop.

  Heat treatment shop.

  Fitter's shop.

  Tool preparation shop.

- Maintenance Department

- General Services

- General Offices

iv) Basic specifications for engineering services:

Building.

Electric power.

Water.

Fuels.

Compressed air.

v) Installation planning.

vi) Management and personnel.

Management needs, with process and market experience.

Staff requirements.

Technical personnel.

Workmen.

Training program envisaged.

vii) Economic analysis:

Investments.

Capital and financing.

Production cost.

Break Even Point.

Investment return.

Cash-flow.

viii) Concept of the venture:

Government's role in promoting the venture.

Selection of partners for the joint venture.

Equity participation.

Selection of suitable partners for management and consulting contracts.

6.4. HAND TOOLS PLANT

A. Background Information

The manufacturing sector has been one of the most dynamic sectors of the economy of Zambia ever since independence. It merited special government attention in the development plans; the Second National Development Plan is presently in effect (1972-76). In spite of the preceding, a study carried out by UNIDO with the agreement of the Government of Zambia in 1975/76 detected the existence of various product lines that can be manufactured in the country. Nevertheless, they are practically all imported.

One of these lines consists of hand tools such as rakes, shovels, picks, mattocks, hoes, axes, scrapers, hammers, sledges, pointers, burins, etc. These tools are intended for agriculture, construction, industry in general, and domestic uses. Considering present imports, the development of the consumer sectors indicated, and particularly the high priority which agriculture will be assigned in the next development plan, it is estimated that by 1980 in Zambia, hand tools valued at 1.2 million K could be manufactured. Future expansion should be planned. By target year 1985, invoicing could exceed 50% of the aforementioned figure.

As a result of these facts, it was decided to conduct a feasibility study of a plant dedicated to these products. Details follow.

B. Objectives of the project

1. Inmedite objectives

To prepare a feasibility study of a new plant for the manufacture of hand tools in Zambia.

2. Long range objectives

a) To substitute the importation of hand tools, producing the maximum number possible within the country according to a previously established plan.

b) To use local raw materials to the maximum. For this reason, until an iron and steel industry exists, in the present case, they will have to start with unfinished imported iron and steel products, performing most finishing and transformation locally.

c) To develop maximum utilization of the remaining local resources and, in particular, to make use of the labor force, contributing to its training. In the present case, this can be especially important in the fabrication of dies, which will progressively be nationalized.

d) To promote the development of local technology as well as of the country's engineering firms.

e) To promote Zambian exports, both for the limited size of the local market, which in itself does not warrant the construction of large plants, as well as for the need to diversify the countrys exports, reducing then dependence on a small number of products.

C. The Scope of Contracting Services

1. General outline

a) The study will contain Data Analysis of the tools to be manufactured and a program for their incorporation into successive production.

b) Recommendations and specifications on process equipment, layout, etc., for use by the Ministry of Mining and Industry in calling for tenders for construction of the plant, should this be decided.

c) Analysis and recommendations on the various options available to Zambia for obtaining finance and know-how from both domestic and international sources.

2. Scope of work

The following studies will be carried out:

a) Situation of the market

i) The study will cover a detailed analysis of the domestic market for tools in order to select the products to be manufactured in the successive stages of the plant.

ii) Establish a priority among these products and select an immediate production line for those models easiest to manufacture and, if possible, of greatest importance in the volume of imports.

iii) Possibilities of export to neighboring countries will be studied.

iv) Present prices in the internal market will be compared with those currently in effect in the producing countries. The possible savings in foreign exchange in the different stages will be evaluated.

b) Feasibility study

Based on the conclusion obtained from the market study, the feasibility study will include:

i) Previous decisions.

Minimum capacity of the plant, both from a technical and economic point of view.

Appropriate and alternative production processes.

Location of the installation.

Maximization of the parts of the plant to be built and assembled in Zambia and the contribution of local engineering firms.

ii) General plans of the plant with the approximate location of the machinery.

iii) Basic specifications and list of equipment and spare parts for the following sections:

Warehouses for raw material.

Drop forging lines.

Finishing and heat treatment.

Mechanization.

Carpentry.

Painting and packing.

Warehouses and shipping.

Laboratory and production control.

Die shop.

Maintenance shop.

Technical office.

General office.

General services.

iv) Basic specifications for engineering services:

Building.

Electric Power.

Water.

Fuel

Compressed air.

The most important machinery will be:

- Parallel lathes
- Vertical lathe
- Saw
- Post drill
- Milling machines
- Vertical planer
- Conical gear cutting machines
- Gear cutting machines for up to modules 4, 7, 12.
- Special gear cutting machine
- Grinding machines
- Internal and external grinding machines
- Miscellaneous: instruments, hardness testers, comparators, etc.

5.5.2.5.4. Technical Data

- Building: 1,200 m^2
- Electric power required: 100 KVA
- Industrial water with decalification unit for coolant and heat treatments.

5.5.2.4. Work Force

The personnel is divided this way:

Management and General Services:	20
Technical Division:	20
Foundry:	60
Machine Shop:	130
Gears Shop:	35
Factory Services:	10
	275

v) Installation planning.

vi) Management and personnel.

Management needs, with process and market experience.

Staff requirements.

Technical personnel.

Workmen.

Training program envisaged.

vii) Economic analysis.

Investments.

Capital and financing.

Cost of manufacturing.

Break Even Point.

Investment return.

Cash-flow.

viii) Concept of the venture.

Government's role in promoting the venture.

Selection of partners for the joint venture.

Equity participation.

Selection of suitable partners for management and consulting contracts.

7. ACTION PLAN

The present chapter is conceived on two levels. The first level concerns the accomplishment of the projects proposed, whether for new plants or the expansion of already existing ones. The second level refers to a broader framework, which is the overall development strategy for manufacturing equipment and spare parts for the mining industry of the country. Naturally, this second level, which is of a general nature, affects the first level, which is more specific.

As far as the proposed projects are concerned, those actions relating to their specific circumstances are easy to program. This does not mean that these projects are easy to accomplish. The steps are: conducting the corresponding feasibility studies, programing the training of the necessary manpower, agreement with the government concerning incentives, encouragement, and tariff protection, search for necessary financing, etc.

In addition to these specific actions, the outlined projects will be subject to an overall strategy which is going to be the focal point of this chapter in the part affecting them.

A commission formed by the Government and the mining companies already exists to study the substitution of imports of intermediate inputs. This commission is at the senior executive level, and this operating level should be respected. Nevertheless, another parallel path should also be followed. The mining companies utilize a total of 350,000 distinct items annually. Therefore, it is deemed a matter of immedite necessity for a working committee to be formed to collaborate with the previously mentioned commission, and to begin compiling a listing of the volume and value of these 350,000 items, to examine them, and to evaluate the possibilities of making them in Zambia, assigning priorities, and drawing up a program of increasing nationalization

of these manufactures. This is a task that can be completed in the space of two years. This committee should include persons appointed by Government, by the mining companies, and by the manufacturing industry. The works of this committee will be examined by the already existing commission and the Government will make the final decisions.

It must be emphasized that all of the items must be examined, not only those concerned in the present study. For example, the Tecniberia team has been able to ascertain that a large quantity of clothing, shoes, detonators, chemical reagents, etc. are imported. It is difficult to accept the fact that their manufacture in Zambia has not been undertaken.

One of the essential tasks that should be undertaken by the committe, once the items have been listed by volume and value, is to propose a program of standardization of these items. The multiplicity of types and subtypes of items that fulfill the same function is really out of all proportion and difficult to justify. Any effort at simplification in this direction would have immediate effects both in rationalizing purchases and in facilitating the handling of data, a task which, at the present time, is truly arduous.

While this examination is taking place, an incentive plan should be worked out which would affect both producers and consumers. The following could be among the tools to be employed:

1. A plan for replacing imports in each specific case, with a mandatory, gradual reduction of imports, on a previously fixed schedule.

   This plan for substituting imports should include a commitment of the Government to assure that the items manufactured

in Zambia will be of competitive quality and price, allowing for a system of compensations if such is not the case.

2. Aggressive utilization of the tariff system. The tax collection goal should be secondary and the tariff should above all effectively protect national industry. Nevertheless, at the same time, a program of progressive reduction of the import duties set should be worked out, so that such protection would not serve to cover up future lack of efficiency in the manufactures undertaken.

3. Making more flexible the present system of the repatriation of profits now in force in Zambia, tying the possibilities for a greater repatriation of profits to a preliminary substitution of imports. This system will be established in a positive and determined manner, for a prolonged period of time. The system will affect both the firms that import the products to be replaced as well as the firms that manufacture the alternative goods in Zambia.

4. As far as new enterprises or the expansion of already existing ones is concerned, a more generous fiscal policy than the present one should be followed. The period of fiscal benefits granted by the Government should be extended to ten years and a new instrument should be introduced: a tax remission on investments. This tax relief would be established on a one time basis as a percentage of the investment and its amount would be deductible from the income tax on companies beginning in the fiscal year in which the new investment would begin functioning.

An equally generous tax relief should also be granted on exports.

5. Modifications in the systems of financing in two channels: subsidy and credit.

Those projects deemed of high priority should benefit from direct government subsidies whether or not the Government has any direct share in the capital of the enterprise.

This subsidy "a fonds perdu" would reach different proportions with respect to the total investment. The conditions under which a subsidy would be granted would be clearly established beforehand.

It would be desirable to create an industrial credit institution which would make funds available to new projects at a advantageous discount interest rate and with ample time for debt redemption. Diverse levels of credit would be established under similar conditions to those for subsidies.

Lacking this institution, those institutions already operating in the country will be assigned obligatory investment coefficients for this type of project or, at least, these projects will be declared priority projects for the purpose of obtaining credit.

Priority lines of credit for exports will likewise be established.

A system of insurance to cover export risks for industrial products, especially non-payment, is also desirable.

6. The Government will provide the infrastructure, collective equipment and, in general all the public utility capital needed for accomplishing the projects.

The programmes of professional and technical training are especially important. These programmes will be carried out in collaboration with the producing enterprises.

7. The creation of an entity to manage industrial projects might prove worthwhile. There is no question of competing with already existing planning organs, nor with corporations such as ZIMCO, INDECO, etc., but rather of an entity that would offer management assistance to those enterprises that already exist or are to be constituted. Such assistance would be both in the formulation of the projects as well as negotiations at all stages, administrative approval, obtaining of financing, legal consultation, etc.

8. Zambia should also plan to create a two purpose consulting and engineering institute. On the one hand, it should be a center for documentation and information of a technical and economic nature. On the other, it should perform economic-financial analyses, feasibility studies, the drawing up of projects, etc. Starting with relatively simple tasks, matters of increasing difficulty should be included.

   In the initial stages and for a certain period of time, they will have to rely on outside help.

   This institution should be essentially a practical one, avoiding academic complications. This should be borne in mind both at the time it becomes necessary to decide what government entity it will be assigned to, as well as when it comes to apply for the technical assistance previously mentioned. Continuous and direct collaboration with industry is essential.

9. The drawing up of an investment code is necessary. In this code, made as clear as possible, everyting will be included that fundamentally can affect investments: legislation, incentives, financing, government agreements, negotiations, etc.

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(2 of 2)

PRE-FEASIBILITY STUDY FOR THE MANUFACTURE OF MINING EQUIPMENT IN ZAMBIA

FINAL REPORT

VOL II: ANNEXES

TECNIBERIA
MADRID - SPAIN

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

PRE-FEASIBILITY STUDY FOR THE MANUFACTURE OF MINING EQUIPMENT IN ZAMBIA

FINAL REPORT

VOL II: ANNEXES

Project Nº. IS/ZAM/74/020
UNIDO Contract Nº 75/37
TB Ref. Nº 1.90.4.1

TECNIBERIA
July 1976

SUMMARY

Management: 1 General Manager
1 Administrative Director
1 Technical Director
1 Marketing Director
1 Sales Director
1 Chief Personnel
1 Chief Acconntant
1 Cashier
12 Clerks

Technical Division: 1 Division Chief
1 Technical Office Chief
1 Laboratory Chief
5 Draftsman
2 Analysts
2 Test Technicians
8 Control Assistants

Foundry: 1 Technical Director
1 Chief of Molding Studies
2 Assistants to Molding Studies
1 Metallurgist
1 Assistant Metalurgist
2 Master Molders
6 Molders
1 Master Patternmaker
2 Patternmakers
3 Maintenance Men
40 Workers and Others

Pág.

ANNEX - 1

TABLES

TABLE 3.1

1973 COMPARATIVE DATA. ZAMBIA AND OTHER COUNTRIES OF ITS REGIONS

	Population		Area ('000 km^2)	Density (person/km^2)	GNP Per Capita		GNP Agricultural as % of total	Imports Per Capita (US $)
	Total (million)	Urban (%)			Total (US $)	Agricultural (US $)		
Botswana	0.64	13	600	1.1	231	65	28.1	n.a.
Burundi	3.58	2	28	127.9	80	50	62.5	9
Kenya	12.48	10	583	21.4	180	57	31.7	47
Malawi	4.83	6	118	40.9	108	50	46.3	23
Rhodesia	5.90	n.a.	389	15.2	334	53	15.9	69
Rwanda	3.98	3	26	153.1	67	42	62.7	9
Swaziland	0.46	8	17	27.1	301	99	32.9	n.a.
Tanzania	13.97	7	945	14.8	122	48	39.3	32
Uganda	10.83	7	236	45.9	158	83	52.5	9
Zaire	19.61	25	2.345	8.4	160	22	13.8	40
Zambia	4.65	34	753	6.2	419	32	7.6	115

Source: -United Nations
-World Bank Group
-Own elaboration

TABLE 3 2

POPULATION: 1963, 1969 AND 1974

	1974 Population ('000)	1969-1974 Average annual growth rate (%)	1969 Population ('000)	1963-1969 Average annual growth rate (%)	1963 Population
Total Zambia	4,695	3.0	4,056	2.5	3,490
Provinces:					
Central	920	5.2	713	5.9	505
Copperbelt	1,046	5.1	816	7.0	544
Eastern	568	2.2	510	1.0	480
Luapula	321	-0.9	335	-1.0	357
Northern	580	1.3	545	-0.6	564
North-Western	256	2.0	232	1.6	211
Sorthern	540	1.7	496	1.0	466
Western	463	2.5	410	2.1	363
Large Urban Areas:					
Chililabombwe	56	4.5	45	4.7	34
Chingola	134	5.3	103	9.6	60
Kabwe	98	8.2	66	8.9	40
Kalulushi	41	4.9	32	7.2	21
Kitwe	251	4.7	200	8.4	123
Livingstone	58	5.1	45	5.4	33
Luanshya	121	4.7	96	4.2	75
Lusaka	401	8.9	262	13.4	123
Mufulira	136	4.8	108	5.0	81
Ndola	229	7.5	160	9.5	93
Total Urban (including small urban areas)	1,656	6.8	1,192	8.9	715
Total Rural	3,039	1.2	2,865	0.5	2,775
Percentage Urban	35.3		29.4		20.5

Source: Central Statistical Office, Lusaka

TABLE 3.3

PRIMARY AND SECONDARY SCHOOLS ENROLMENT, 1964-73

Year	A. Primary School			B. Secondary School		
	Lower 4 years	Upper 3 years	Total	Junio 3 years	Senior 2 years	Total
1964	285.212	93,205	378,417	10,947	2,906	13,853
1965	205,353	104,740	410,093	13,952	3,235	17,187
1966	340,802	132,630	473,432	20,422	3,567	23,989
1967	379,014	160,338	539,352	29,943	4,196	34,139
1968	424,602	184,291	608,893	36,583	5,805	42,388
1969	462,891	198,390	661,281	38,761	9,396	48,157
1970	483,197	211,473	694,670	39,171	13,301	52,472
1971	499,582	230,219	729,801	41,101	14,904	56,005
1972	524,217	253,656	777,873	45,913	14,138	60,051
1973	539,931	270,922	810,853	47,985	13,369	61,354
Growth rate 1964/73	89,3%	190,6%	114,3%	338,3%	360,0%	342,9%

TABLE 3.4

WAGE EMPLOYMENT

	December 1967		June 1974		Total Δ 1967-74		Δ 1967-74 as % of 1967
	Persons	%	Persons	%	Persons	%	
1. Agriculture, forestry and fisheries	35.090	11.3	36,520	9 4	1,430	2.0	4 1
2. Mining and quarrying	54,740	17.5	64,030	16.6	9,290	12.5	17.0
3. Manufacturing	32,310	10 4	43,130	11 2	10,820	14.6	33.5
4. Electricity and water	2,970	0.9	5,470	1.4	2,500	3.4	84.2
5. Construction and allied repairs	67,520	21.6	74,770	19.4	7,250	9 7	10.7
6. Commerce, restaurants and hotels	31,510	10.1	35,740	9.2	4,230	5.7	13.4
7. Transport and communications	20,320	6.5	26,450	6 [illegible]	[illegible]	[illegible]	30.2
8. Finance, insurance, realestate and business services	6,880	2.2	14,580	3.8	7,700	10.4	111.9
9. Social and personal services (1)	60,710	19 5	85,580	22.2	24,870	33.5	41.0
TOTAL	312,050	100.0	386,270	100.0	74,220	100.0	23.8
I. Sector (1+2)	89,830	28.8	100,550	26.0	10,720	14 5	11.9
II. Sector (3+4+5)	102,800	32.9	123,370	32 0	20,570	27 7	20.0
III. Sector (6+7+8+9)	119,420	38.3	162,350	42.0	42,930	57 8	35.9
TOTAL	312,050	100.0	386,270	100.0	74,220	100.0	23.8

(1) Excluding domestic services

Source -Central Statistical Office, Lusaka
-Own elaboration

TABLE 3.5

WAGE EMPLOYMENT: ZAMBIAN (AFRICAN) AND OTHERS

	December 1967		June 1974		Δ 1967/74
	African Employees		Zambian Employees		%
	Persons	%	Persons	%	
1. Agriculture, forestry and fisheries	34,560	12.2	34,880	9.9	0.9
2. Mining and quarrying	48,320	17.1	52,820	15.0	9.3
3. Manufacturing	29,560	10.5	39,710	11.3	34.3
4. Electricity and water	2,540	0.9	4,900	1.4	92.9
5. Construction and allied repairs	64,820	22.9	70,440	20.1	8.7
6. Commerce, restaurants and hotels	26,210	9.3	32,010	9.1	22.1
7. Transport and communications	17,870	6.3	24,620	7.0	37.8
8. Finance, insurance, real estate and business services	4,580	1.6	12,650	3.6	176.2
9. Social and personal services (1)	54,310	19.2	79,160	22.6	45.8
TOTAL	282,770	100.0	351,190	100.0	24.2
	Non-African Employees		Non-Zambia Employees		
	Persons	%	Persons	%	
1. Agriculture, forestry and fisheries	530	1.8	1,640	4.7	209.0
2. Mining and quarrying	6,420	21.9	11,210	32.0	74.6
3. Manufacturing	2,750	9.4	3,420	9.8	24.4
4. Electricity and allied repairs	430	1.5	570	1.6	32.6
5. Construction and ellied repairs	2,700	9.2	4,220	12.3	60.4
6. Commerce, restaurants and hotels	5,300	18.1	3,730	10.6	-29.6
7. Transport and communications	2,450	8.4	1,830	5.2	-25.3
8. Finance, insurance, real estate and business services	2,300	7.8	1,930	5.5	-16.1
9. Social and personal services (1)	6,400	21.9	6,420	18.3	0.3
TOTAL	29,280	100.0	35,080	100.0	19.8

(1) Excluding domestic services

Source: -Central Statistical Office, Lusaka . -Own elaboration

Machine Shop:

1 Technical Director
1 Office Head of the Mechanization Studies
2 Assistants Mechanization Studies
2 Lathe Masters
2 Milling and Grinding Machines Masters
2 Tool Masters
2 Fitter Masters
10 Machinist I
30 Machinist II
30 Machinist III
3 Maintenance Men
45 Workers and Others.

Gears Shop:

1 Technical Director
2 Master
5 Machinist I
8 Machinist II
12 Machinist III
1 Maintenance Man
6 Workers and Others.

5.5.2.5. **Know-How**

Know-how should be provided by a well-known foreign manufacturer. It would also be desirable for this manufacturer to be a partner of the proposed shop, taking part in its installation, start up, and later operation.

For the fabrication of pumps and valves, licenses should be obtained from a firm which compromises to give all asistance necessary for its fabrication in Zambia.

TABLE 3.6

LABOUR EXCHANGE STATISTICS

	Persons seeking employment		Vacancies	
	New registration	Registered as (1) unemployed	Notified during the period	Filled during the period
1964	52,142	11,120	16,340	12,199
1965	82,107	17,560	26,418	19,290
1966	64,967	16,405	33,630	26,003
1967	54,718	12,254	32,989	24,346
1968	55,786	12,909	27,482	22,262
1969	52,259	15,308	26,050	19,855
1970	56,108	10,250	24,591	17,418
1971	53,821	10,248	30,173	22,549
1972	51,749	12,615	40,190	24,490
1973	45,271	9,285	26,947	21,800
1974	42,237	n.a.	36,465	26,852
1975 (January--July)	31,837	12,369	23,454	17,411

(1) Yearly figures are averages of monthly data

Source: Central Statistical Office, Lusaka

TABLE 3.7

AVERAGE ANNUAL EARNINGS OF EMPLOYES, 1.972

(Kwacha)

	African Employees		
	Public sector	Private sector	Total
1. Agriculture, forestry and fisheries	585	277	376
2. Mining and quarrying	-	1,491	1,491
3. Manufacturing	1,115	848	853
4. Electricity and water	737	1,250	769
5. Construction and allied repairs	493	760	674
6. Commerce, restaurants and hotels	691	827	864
7. Transport and communications	1,441	1,053	1,311
8. Finance, insurance, real estate and business services	1,615	1,010	1,031
9. Social and personal services (1)	859	699	831
TOTAL	868	1,004	960
	Non-African Employees		
	Public sector	Private sector	Total
1. Agriculture, forestry and fisheries	5,788	3,955	4,515
2. Mining and quarrying	-	6,971	6,971
3. Manufacturing	4,340	6,256	6,128
4. Electricity and water	5,286	8,854	6,346
5. Construction and allied repairs	3,595	6,424	6,479
6. Commerce, restaurants and hotels	4,218	4,942	5,140
7. Transport and communications	5,569	5,432	5,553
8. Finance, insurance, real estate and business services	5,594	6,310	5,327
9. Social and personal services (1)	2,877	3,243	2,968
TOTAL	3,777	5,853	5,500

(1) Excluiding domestic services

Source: Central Statistical Office, Lusaka

TABLE 3.8

PAY SCALES 1975 (KWACHA/MONTH)

DESCRIPTION	Level	Pay range
Production and General Services		
Crane chaser-General, Workman-Parks and Garden, Attendant-Laboratory, etc.	1	60-90
Courier-Motor Cycle, Pipe Threader, Operator-Band Saw, etc.	2	75-100
Driver-Light Van/Lorry, Mechanic III (all trades), Shunter-Main Line, etc.	3	80-110
Driver-Mobile Crane (up to 10 t), Driver Lorry, Laboratory Operator	4	90-120
Driver-Mobile Crane (up to 15 t), Instructor-Carpentry, Mechanic II, etc.	5	100-150
Compressor-Operator, Driver-Bulldozer, Mechanic I, Driver-Mobile Crane (up to 25 t), etc.	6	140-190
Leading Mechanic, Supervisor-Plumbing, Converter Operator-Smelter, etc.	7	170-225
Mechanic Supervisor, Section Boss-General Smelter, Rail Traffic Controller, etc.	8	210-270
Senior Instructor, Section Boss-Casting, Section Boss-Stope Drilling	9	240-300
Shift Boss, Shift Foreman-Smelter, Chief Instructor, etc.	10	290-360
Assistant General Foreman, Foreman-Transport, Shift Boss-Shafts, etc.	11	330-400
Technical Services		
Microscopist, Sampler-Geological, Tracer-Drawing Office, etc.	1	100-150
Health Assistant, Draughtsman II, Assistant Surveyor, etc.	2	150-210
Artisan (all trades), Soils Analyst, Assayer (Certificated) Analytical Laboratory, etc.	3	210-270
Engineering Draughtsman, Work Study Officer, Laboratory Technologist, etc.	4	240-300
Chemist, Geologist, Senior Engineering Draughtsman, Operational Research Analyst, etc.	5	290-360
Senior Chemist, Project Geologist, Sectional Work Study Officer, etc.	6	330-400
Clerical and Administrative Services		
Telephone Operator, Printroom Attendant, Filing Clerk	1	80-110
Receptionist/Telephonist, Clerk-Invoice Matching, Junior Typist, etc.	2	100-130
Typist, Telex Operator, Clerk-Bonus Calculations, etc.	3	110-150
Clerk-Statistics, Clerk-Planned Maintenance, Senior Receptionist, etc.	4	140-190
Senior Typist, Assistant Job Analyst, Supervisor-Printroom, etc.	5	170-230
Paymaster, Clerk-Cost Accounts, Supervisor-Home Economics, etc.	6	210-270
Job Analyst, Manning Control Officer, Senior Clerk-Stock Control, etc.	7	240-300
Assistant Accountant, Chief Stores Assistant, Assistant Computer Liaison Officer, etc.	8	290-360
Assistant Internal Audit, Statistician-Analytical, Stock Controller, etc.	9	330-400

Source: -Own elaboration.

TABLE 3.9

CONSUMER PRICES

HIGHER AND LOWER INCOMES. JANUARY, 1962=100

Year	Combined index		Higher incomes index		Lower incomes index	
	All items	Food	All items	Food	All items	Food
1963	101.8	100.2	102.1	99.9	101.3	100.6
1964	105.7	103.1	106.2	102.2	104.5	103.7
1965	111.9	109.9	110.7	106.5	113.0	113.2
1966	120.7	120.5	116.3	112.9	124.5	127.8
1967	126.9	126.9	122.2	118.2	130.7	134.4
1968	139.5	138.9	132.7	130.5	144.9	145.7
1969	144.8	142.5	138.5	132.8	148.4	148.0

LOW INCOME GROUP. 1969=100

	All items	Food, beverages and tobacco	Clothing, footwear and accessories	Rent and rates, fuel and lighting	Furnishings and furniture, household equipment and operations	All other goods and services
Weight	1,000	647	136	111	65	41
1970	102.6	102.1	102.1	102.7	106.7	104.8
1971	108.8	108.8	108.7	105.9	114.2	111.1
1972	114.6	113.9	117.6	108.8	123.3	117.1
1973	121.9	121.5	126.2	113.0	132.4	122.6
1974	132.1	132.6	137.1	117.3	140.9	134.0
1975 June	144.9	147.1	147.2	123.3	150.6	150.8

HIGH INCOME GROUP. 1969=100

	All items	Food, beverages and tobacco	Clothing, footwear and accessories	Gross rent, fuel and light	Furniture, furnishings and household	Medical care and health services	Transport and communications	Recreation, entertainment and education	Other goods and services
Weight	1,000	309	79	194	130	13	158	79	38
1970	105.0	103.0	103.5	111.8	104.7	100.1	101.8	103.8	102.2
1971	110.9	109.7	109.4	119.7	109.1	102.0	107.3	110.3	104.2
1972	118.7	119.9	120.0	121.5	118.5	108.4	118.4	113.6	107.7
1973	126.4	128.8	131.9	125.6	128.6	113.2	127.1	119.1	111.4
1974	138.1	144.3	146.1	129.3	139.7	118.7	142.5	129.4	115.7
1975 June	149.7	159.7	158.0	135.5	148.2	125.5	160.9	134.8	121.3

Source: Central Statistical Office, Lusaka.

TABLE 3.10

WHOLESALE PRICES, 1966 = 100

Year/Month (1)	Total All Commdodities	Agriculture, Forestry and Fishing	Mining and Quarrying	Manufacturing	Electricity	Total Non-Copper
Weight	1,000	82	459	443	16	572
1967	99.1	102.3	93.1	104.3	111.2	103.9
1968	106.7	104.4	102.1	111.8	109.5	110.4
1969	119.0	112.9	120.6	119.3	96.5	117.4
1970	119.6	129.1	117.4	121.5	94.5	121.5
1971	111.3	148.5	90.6	126.5	92.8	128.0
1972	114.9	146.6	89.5	136.1	92.8	136.4
1973	138.0	152.8	134.6	140.3	91.0	143.5
1974	155.8	188.9	159.0	148.6	87.7	158.7
1974 July	152.0	192.1	148.5	150.5	82.0	159.4
August	147.7	188.6	139.7	150.9	81.7	159.1
September	136.4	186.4	115.1	151.0	86.0	158.1
October	136.3	186.6	112.6	153.4	85.2	158.9
November	136.8	184.2	111.6	155.7	91.1	158.5
December	134.8	203.7	102.8	157.1	84.1	159.0

(1) Annual figures are averages of monthly figures.
Source: Central Statistical Office, Lusaka.

TABLE 3.11

GROSS DOMESTIC PRODUCT AT CURRENT PRICES

(REVISED SERIES, 1975)

(K'million)

Sector	Former SNA						Present SNA				
	1965	1966	1967	1968	1969	1970	1970	1971	1972	1973	1974
Agriculture Forestry and Fishing	97.4	106.8	109.9	114.3	118.5	120.7	132.0	150.3	158.4	157.0	171.5
Mining and Quarrying 1)	291.8	380.3	380.5	412.7	639.3	460.1	462.4	300.3	324.0	568.0	622.0
Manufacturing	48.0	69.0	86.1	105.8	113.9	127.4	127.4	142.0	182.3	210.0	242.0
Electricity Gas and Water	5.4	7.4	8.4	12.6	14.2	15.5	15.5	18.2	25.7	30.5	32.0
Construction	48.9	51.5	56.9	62.3	67.5	74.5	82.3	89.4	93.3	97.5	106.0
Wholesale and Retail Trade	80.5	74.5	103.5	124.5	92.4	119.3	119.3	113.7	140.7	155.0	186.0
Hotels and Restaurants	4.0	4.9	5.2	5.8	11.6	16.7	10.8	12.3	13.8	15.0	16.5
Transport, Communication and Storage	32.8	31.3	50.0	48.4	44.1	42.5	52.0	66.1	74.9	82.5	95.5
Financial Institutions and Insurance	10.7	11.4	15.9	19.2	30.2	44.8	41.8	40.7	44.1	48.0	60.0
Real Estate	11.6	14.7	18.6	19.9	32.2	37.3	37.3	39.2	38.4	40.5	41.5
Business Services	9.5	8.7	13.4	15.6	13.6	16.7	16.7	15.4	13.7	15.0	16.5
Community Social and Personal Services	64.0	70.1	93.7	102.1	108.2	125.8	144.7	174.3	183.4	194.0	208.5
Import Duties	14.5	12.3	15.0	19.0	27.8	27.7	32.1	36.7	41.8	38.0	50.0
Less imputed bank service charges	-	-	-	-	-	-	-16.7	-20.4	22.3	23.0	-28.0
Total GDP	711.1	848.2	957.1	1,062.0	1,313.5	1,216.9	1,257.7	1,178.2	1,311.9	1,628.0	1,820.0

1) Smelting and refining are included in this sector

Source: Central Statistical Office, Lusaka

TABLE 3.12

GROSS DOMESTIC PRODUCT AT CONSTANT (1965) PRICES

(REVISED SERIES, 1975)

(K'million)

Sector	Former SNA						Present SNA				
	1965	1966	1967	1968	1969	1970	1970	1971	1972	1973	1974
Agriculture Forestry and Fishing	97.4	99.6	98.8	99.6	101.6	106.0	109.5	112.0	118.2	114.5	117.0
Mining and Quarrying (1)	291.8	243.5	229.9	222.0	254.9	221.9	223.8	195.1	219.1	211.6	217.2
Manufacturing	48.0	57.5	66.8	72.7	74.2	81.0	81.0	85.6	104.0	115.4	128.0
Electricity gas and water	5.4	7.3	7.5	10.4	14.6	16.2	16.2	19.5	27.5	28.6	28.7
Construction	40.9	44.8	38.4	34.3	39.9	34.8	40.1	39.5	43.0	42.5	37.2
Wholesale and retail trade	80.5	72.5	84.4	95.4	67.8	89.7	89.7	85.8	97.1	98.4	108.0
Hotels and restaurants	4.0	4.8	4.2	4.4	8.5	8.1	8.1	9.3	9.5	9.5	9.6
Transport Communication and storage	32.8	30.1	42.5	40.3	35.5	34.6	42.1	50.2	51.7	57.8	63.7
Financial Institutions and Insurance	10.7	12.2	13.3	15.3	15.4	15.9	15.9	16.7	16.1	19.6	22.0
Real Estate	11.6	14.6	18.5	19.8	31.8	33.1	33.1	32.5	31.4	32.0	32.5
Business services	9.5	8.5	10.9	11.9	10.0	12.6	12.6	11.8	9.5	9.5	9.6
Community social and personal services	64.0	68.9	80.0	86.0	82.8	107.5	124.5	134.0	138.4	134.2	132.9
Import duties	14.5	18.0	21.5	23.1	21.5	21.7	25.1	23.0	26.6	22.5	26.2
Less imputed bank service charges		-	-		-	-	-6.1	-6.7	-6.2	-7.5	-8.4
Total GDP (Unadjusted)	711.1	682.3	716.7	735.2	758.5	783.1	815.6	808.3	885.9	888.6	924.2

(1) Smelting and refining are included in this sector

Source Central Statistical Office, Lusaka.

TABLE 3.13

ORIGIN AND AVERAGE INCREASES OF GDP AT CURRENT PRICES

Sector	Former SNA			Present SNA		
	Origin (%)		1965-70	Origin (%)		1970-74
	1965	1970	Average annual growth Rate (%) (1)	1970	1974	Average annual growth Rate (%) (1)
Agriculture, Forestry and Fishing	13.7	9.9	4.4	10.5	9.4	6.8
Mining and Quarrying	41.-	37.8	9.5	36.8	34.2	7.7
Manufacturing	6.8	10.4	21.6	10.1	13.3	17.4
Electricity Gas and Water	0.8	1.3	23.5	1.2	1.8	19.9
Construction	5.8	5.9	11.8	6.5	5.8	6.5
Wholesale and Retail Trade	11.3	9.8	8.2	9.5	10.2	11.7
Hotels and Restaurants	0.6	0.9	21.8	0.9	0.9	11.2
Transport Communication and Storage	4.6	3.5	5.3	4.1	5.2	16.4
Financial Institutions and Insurance	1.5	3.4	31.3	3.3	3.3	9.5
Real estate	1.6	3.1	26.3	3.-	2.3	3.-
Business Services	1.3	1.4	11.9	1.3	0.9	-0.3
Community Social and Personal Services	9.-	10.3	14.5	11.5	11.5	9.6
Import Duties	2.-	2.3	13.8	2.6	2.7	11.7
Less imputed bank service charges		-	-	-1.3	-1.5	13.8
Total	100.-	100.-	11.3	100.-	100	9.7

(1) From data of Table 3.11

Source - Central Statistical Office Lusaka
- Own elaboration

TABLE 3.14

COST STRUCTURE OF THE GROSS DOMESTIC PRODUCT AT CURRENT PRICES

	Former SNA						Present SNA				
	1965	1966	1967	1968	1969	1970	1970	1971	1972	1973	1974
Compensation of employees	243.5	281.6	348.2	386.1	394.7	462.4	475.0	563.1	578.0	619.0	700.0
Operating surplus	318.4	376.3	405.4	396.6	541.4	479.6	463.4	356.5	473.9	562.0	612.0
Consumption of fixed capital	46.6	51.7	61.6	84.3	111.1	109.2	134.4	166.2	150.0	187.0	208.0
Indirect taxes	103.2	156.6	149.9	207.0	283.0	199.4	203.8	120.1	110.0	260.0	300 0
Less subsidies	0.6	18.1	8.1	12.0	16.6	33.7	18.9	27.7			
Gross domestic product at current purchasers' values	711.1	848.4	957.1	1,062.0	1,313.5	1,216.9	1,257.7	1,178.2	1,311.9	1,628.0	1,820.0
	Percentages										
Compensation of employees	34.2	33.2	36.4	36.4	30.1	38.-	37.8	47.8	44.1	38.-	38.5
Operating surplus	44.8	44.3	42.3	37.3	41.2	39.4	36.8	30.3	36.1	34.5	33.6
Consumption of fixed capital	6.6	6.1	6.4	7.9	8.5	9.-	10.7	14.1	11.4	11.5	11.4
Indirect taxes	14.5	18.5	15.7	19.5	21.5	16.4	16.2	10.2	8.4	16.-	16.5
Less subsidies	-0.1	-2.1	-0.8	-1.1	-1.3	-2.8	-1.5	-2.4			
Total	100.-	100.-	100.-	100.-	100.-	100.-	100.-	100.-	100.-	100.-	100.-

Source. Central Statistical Office, Lusaka
Own elaboration

TABLE 3.15

EXPORTS AND IMPORTS

(K'000)

	Exports			Imports	Export surplus
	Total	Domestic	Re-exports		
1964	335, 518	326, 872	8, 646	156, 438	179, 080
1965	380, 294	375, 096	5, 198	210, 742	169, 552
1966	493, 458	490, 332	3, 126	246, 116	247, 342
1967	470, 009	467, 016	2, 993	306, 350	163, 659
1968	544, 415	540, 744	3, 671	325, 184	219, 231
1969	766, 489	754, 449	12, 040	311, 797	454, 692
1970	714, 964	710, 388	4, 576	340, 711	374, 253
1971	485, 177	480, 011	5, 166	399, 282	85, 895
1972	541, 564	536, 043	5, 521	402, 471	139, 093
1973	741, 955	738, 004	3, 952	346, 867	395, 089
1974	905, 092	900, 650	4, 442	507, 015	398, 077
1975 First quarter	110, 849	110, 578	271	145, 104	-34, 255

Source: Central Statistical Office, Lusaka.

5.5.2.6. Economic Data

Invoicing will attain approximately 5,000,000 K.

Cost price distribution is approximately as follows:

Material	23%
Labor	33%
Other Direct Cost	24%
General Expenses and Management	8%
Depreciation	12%
	100%

Recommended gross annual profit would be 20% of sales.

Investment: 4,000,000 K.

TABLE 3.16

EXPORTS OF PRINCIPAL COMMODITIES

	Copper		Zinc		Lead		Manganese Ore		Cobalt		Tobacco		Maize		Timber
	'000 Tonne	K'm	Tonne	K'000	Tonne	K'000	Tonne	K'000	Tonne	K'000	Tonne	K'000	Tonne	K'000	K'000
1964	681	296.8	45,866	9,730	13,354	2,274	26,966	564	1,466	3,494	12,303	5,664	-	-	816
1965	683	343.2	45,153	9,658	15,645	3,440	32,622	704	1,433	3,630	9,716	4,862	47,270	1,894	918
1966	599	460.6	41,548	8,186	24,650	4,672	26,102	602	1,627	4,266	7,264	4,522	39,891	1,796	684
1967	601	434.0	39,804	8,066	17,413	2,696	24,710	516	2,091	5,621	4,449	3,698	198,097	8,749	599
1968	643	516.1	45,017	8,961	16,350	2,738	17,483	399	1,227	3,374	3,541	2,735	63,988	2,838	638
1969	730	724.5	53,576	12,403	25,886	6,061	-	-	1,588	4,536	3,768	3,163	8,441	374	666
1970	684	681.4	50,334	10,961	22,079	4,874	-	-	1,814	6,342	4,041	2,852	60	-	529
1971	635	450.2	49,453	11,507	23,895	4,557	-	-	1,189	4,125	5,212	3,512	8,598	177	423
1972	711	490.9	60,572	16,368	26,694	5,596	-	-	2,329	8,590	4,181	2,737	1,896	100	100
1973	670	698.3	51,115	16,666	20,012	5,411	-	-	1,145	4,862	5,048	4,758	50,086	2,643	5
1974	673.4	838.5	50,227	25,162	18,776	7,150	-	-	1,894	7,926	4,872	5,798	111,212	7,632	-
1975 First quarter	129.5	96.6	14,252	7,351	8,260	2,742	-	-	211	1,148	156	61	16,580	1,430	-

Source: Central Statistical Office, Lusaka.

TABLE 3 17

IMPORTS BY S.I.T.C. SECTIONS

(K'000)

	Total	Food	Beverages and tobacco	Crude materials	Electricity and mineral fuels	Oils and fats	Chemicals	Manufactures classified by materials	Machinery and transport equipment	Miscellaneous manufactured articles	Miscellaneous transactions
1964	156,438	14,264	2,890	3,162	17,446	788	16,320	34,444	42,420	21,120	3,584
1965	210,742	16,532	2,804	3,666	20,600	1,294	20,152	49,750	69,590	25,958	396
1966	246,116	19,788	3,026	4,590	19,600	2,630	19,244	55,118	97,936	23,818	366
1967	306,350	21,372	2,127	4,424	31,231	2,348	20,901	65,509	126,331	28,391	3,815
1968	325,184	24,129	2,171	4,406	33,207	1,944	22,645	74,116	134,444	23,956	4,167
1969	311,797	30,411	2,196	4,494	35,581	2,881	22,562	62,791	123,041	25,613	2,227
1970	340,711	30,451	1,175	5,277	35,184	4,456	26,021	74,797	131,716	30,546	1,094
1971	399,282	48,193	1,417	7,629	32,235	4,516	31,688	84,786	160,115	27,257	1,448
1972	402,471	37,138	1,250	7,943	26,523	3,907	33,041	87,918	168,009	35,377	1,365
1973	346,867	24,344	973	5,420	33,285	4,323	35,136	77,339	138,911	25,383	1,753
1974	507,015	43,801	1,133	10,364	61,095	6,770	48,453	129,984	166,068	36,431	2,915
1975 First quarter	145,104	11,343	305	2,234	11,306	3,211	15,103	37,662	54,599	8,748	593

Source Central Statistical Office Lusaka.

TABLE 4.1.

COMPARATIVE ANALYSIS OF SEVERAL MINING AND RELATED INDUSTRIES

	Number of establishments	Number of persons	Value in 1,000 K of total goods consumed and industrial services rendered	Value of materials and supplies (1,000 K)	Value of repair and maintenance. (1,000 K)
Non ferrous ore	19	55,653	188,257	50,445	31,858
Coal and other mines	5	12,237	2,129	1,106	506
Limestone flux and calcareous stone	25	960	978	147	549
Sand: silica and quartz					
Cement and quicklime	3	993	4,614	2,368	85

TABLE 4 2

COPPER RESERVES

NCCM

	Rokana		Chingola		Konkola		Bwana		Total	
	Thousands tons	Copper %	Thousands tons	Copper %	Thousands tons	Copper %	Thousands tons	Copper %	Thousands tons	Copper %
Fully Developed	7,017	2.26	7,054	4.61	1,017	3.77	?	?	?	?
Partly Developed	20,720	2.33	19,341	5.80	6,076	4.00	?	?	?	?
Indicated and possible	92,098	2.48	225,885	3.18	118,000	3.52	?	?	?	?
TOTAL	119,835	2.44	252,280	3.42	125,093	3.55	3,187	3.53	500,395	3.22

RCM

	Mufulira		Luanshya		Chibuluma		Total	
	Thousands tons	Copper %	Thousands tons	Copper %	Thousands tons	Copper %	Thousands tons	Copper %
Gross reserves	143,392	1.15	136,501	2.56	51,701	3.26	331,594	2.92

TABLE 4.3.

COPPER CONTENT PRODUCTION AND ITS SOURCE IN FISCAL YEAR 1974/75 (t)

	Open pit	Underground	Total
NCCM			
Rokana	29,130	90,820	119,950
Chingola	199,310	145,580	344,890
Konkola	-	52,480	52,480
Bwuna Makubwa	30,110	-	30,110
Total	258,550	288,880	547,430
	47%	53%	100%
RCM			
Mufulira		131,530	131,530
Luanshya		80,290	80,290
Chambishi	27,100	12,300	39,400
Chibuluma		18,580	18,580
Kalengwa	7,300		7,300
Total	34,400	242,700	277,100
	12%	88%	100%

TABLE 4.4.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
11	67120	Pig Iron, Cast iron, in Bricks, Lumps, etc.	T	2,788	3,039	495	1,281	135	92,473	92,460	34,952	83,758	9,802
"	67131	Iron or Steel Shot and Angular Grit.	T	11	4	41	2	19	9,364	2,534	14,645	650	14,533
"	67140	Ferro-manganese.	T	256	349	297	328	633	24,685	42,499	63,589	42,204	74,708
"	67151	Ferro-chromium.	T	63	65	10	1	110	12,900	9,396	1,947	405	11,393
"	67152	Ferro-silicon.	T	197	149	204	207	212	22,553	21,280	31,697	25,114	26,624
"	67159	Ferro-alloys, Other.	T	460	86	37	4	0	59,228	16,957	11,184	8,073	239

Source: - Annual Statement of External Trade.

- Own elaboration.

TABLE 4.5.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
12	67254	Iron or Steel forges Shapes. Other	T	1,125	38	42	445	n.a.	89,301	6,004	8,627	172,448	n.a.
"	67271	Iron or Steel Coils for re-rolling	T	n.a.	81	909	1,883	2,502	n.a.	10,179	105,159	234,736	416,799
"	67311	Wire Rod, Iron or Steel	T	n.a.	20	321	829	948	n.a.	5,006	41,195	129,789	273,120
"	67321	Iron or Steel Bars and Rods, Other	T	25,029	23,416	43,855	22,240	15,980	2,143,437	1,961,684	3,957,974	2,254,304	2,541,818
"	67324	Hollow mining Drill Steel	T	740	898	1,042	959	775	390,655	601,457	715,409	596,753	631,157
"	67341	Angles, Shapes. Iron or Steel	T	16,965	9,868	36,454	15,965	15,129	1,303,114	835,565	3,846,313	1,823,013	2,654,285
"	67411 67414	Plates. Iron or Steel	T	14,760	11,706	41,384	11,335	9,452	1,359,206	1,000,073	3,602,012	1,163,911	1,290,992
"	67421 67429	Iron or Steel sheet, plain	T	14,716	15,909	31,325	13,899	12,873	1,590,738	2,103,396	2,845,587	1,683,745	2,044,073
"	67470	Tinplate	T	921	2,149	3,066	10,718	3,382	156,334	299,903	571,981	614,528	500,337
"	67485	Iron or Steel, galvanised not corr.	T	n.a.	404	322	1,094	78	n a.	65,991	49,560	134,064	32,012
"	67486 67488	Iron or Steel, Galvanised corrugated	T	1,769	2,364	1,506	809	432	375,468	379,194	208,650	111,871	69,259
"	67489	Alloy Steel. High Carbon Steel	T	n.a.	361	312	87	332	n.a.	92,112	158,435	59,566	169,691
"	67501	Hoop and Strip. Iron or Steel. Rolled	T	145	1,025	1,003	278	2,648	30,662	153,572	150,386	73,076	487,236
"	67611 67612	Rails. Iron or Steel not ex 30 LB/Yard	T	4,039	4,382	2,745	3,019	3,976	326,290	355,876	299,396	390,024	439,513
"	67621	Sleepers. Iron or Steel	T	2,201	7	31	63	826	300,931	700	3,080	11,912	70,242
"	67629	Railway track construc. mat. iron, Steel		n.a.	845	3,358	3,909	3,248	n.a.	159,745	542,333	698,703	399,739
"	67701 67709	Iron or Steel wire. Baling or Binding	T	1,398	6,377	9,160	4,286	4,523	177,787	957,382	1,338,958	764,809	891,990

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.6.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
14	68221	Copper Wire	T	n.a.	123	119	34	41	n.a.	155,383	137,991	49,601	19,621
"	68222	Copper, Wrought Plates, Sheet strip	T	n.a.	137	210	50	70	n.a.	166,356	269,939	73,996	111,694
"	68225	Copper Tubes, Pipes and hollow Bars	T	53	105	131	34	17	77,688	157,031	270,565	69,157	35,292
"	68226	Copper tube and pipe fittings	T	5	65	78	92	15	12,181	125,796	205,286	197,521	48,107
"	68229	Copper, Wrought. Other	T	n.a.	196	149	95	150	n.a.	157,366	140,761	106,936	214,820
"	68235	Copper Bars and Ingots	T	97	194	101	87	111	130,249	154,781	43,513	129,855	157,661

Source: Annual Statement of External Trade
Own Elaboration.

TABLE 4.7.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
15	72310	Insulated electric wire, cable, bars, etc	T	6,187	4,106	4,310	3,393	2,222	4,801,055	3,352,301	4,289,046	3,228,895	2,380,285

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.8

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
31	62105	Piping, Tubing. Other Rubber, Vulcanised	T	551	363	438	301	264	571,097	407,679	441,681	406,391	428,521

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.9

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
32	62912	Tyres. Tractor, Bulldoser, etc.	T	2,268	2,207	3,013	2,320	3,193	2,981,581	2,906,115	4,347,465	3,435,122	4,103,103
"	62915	Tyres. Other Motor Vehicles	T	1,411	531	585	288	176	1,268,344	664,841	610,836	422,005	251,949

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.10

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
33	62949	Belts, Belting. Other Rubber, Vulcanised	T	849	423	588	714	536	948,851	588,168	882,607	973,878	710,564

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.11

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
34	62109	Sealing Rings. Disks, Rubber, Vulcanised	T	n.a.	26	23	18	11	n.a.	59,434	73,680	47,503	24,825
"	62984	Sealing Rings. Disks, Rubber, Vulcanised	T	n.a.	25	45	51	64	n.a.	70,883	117,559	158,429	233,843

Source: Annual Statement of External Trade.
Own Elaboration.

5.5.3. Hand Tools Plant

5.5.3.1. Introduction

The needs of hand tools are not excessively great in Zambia, but considering the relative simplicity of their manufacture, it is possible to make in Zambia a large part of the hand tools that are imported at the present time. Moreover, it must be remembered that high priority will be accorded agriculture in the next development plan. For this reason, together with the remaining uses to which these tools will be assigned (construction, general industry, and domestic uses), it is possible to reach an initial invoicing of 1.2 million K by 1980. This could be increased by a least 50% in about 1985. Hence, future expansion of the plant herein proposed should be considered.

5.5.3.2. Technical Specifications

The purpose of the plant is to produce hand tools destined for industry, agriculture, miscellaneous uses. Examples of the products to be made are: rakes, shovels, picks, mattocks, hoes, axes, scrapers, hammers, sledges, pointers, burins, screwdrivers, spanners, wrenchers, etc.

The plant will have three drop forging lines capable of expansion if the future market and diversification of products warrant it.

5.5.3.3. Raw Materials

The raw material is carbon or alloy steel in the form of billets, flats, or plates.

This raw material will have to be imported.

TABLE 4.12.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
41	67811	Downpiping, Guttering, cast iron	T	793	14	106	-	111	180,095	2,857	29,683	-	25
"	67819	Cast Iron Piping and Tubing. Other	T	n.a.	759	907	4,857	5,459	n.a.	103,203	175,142	1,514,824	1,570,420
"	67839	Tubes and Pipes, Iron or Steel. Other	T	16,451	11,836	21,499	10,335	5,152	3,581,734	2,368,204	4,133,594	2,328,598	1,764,126
"	67851 67859	Downpiping, Guttering Fittings. Iron, Steel	T	1,087	3,370	4,030	3,930	1,176	661,415	1,175,511	1,674,100	2,151,591	1,149,035

Source: Annual Statement of External Trade
Own elaboration.

TABLE 4.13.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
51	72211	Electric motors-under ?	NO	980	602	2,534	15,554	1,506	27,364	11,863	47,901	130,085	24,641
"	72212	Electric motors-from 1-50 HP	NO	936	1,260	2,424	3,690	2,230	105,050	167,441	220,477	291,197	168,414
"	72213	Electric motors-from 51-100 HP	NO	176	161	318	381	670	87,572	85,217	112,199	173,575	288,443
"	72214	Electric motors over 100 HP	NO	90	117	246	286	311	449,258	418,428	735,733	805,977	658,271

Source: Annual Statement of External Trade
Own elaboration.

TABLE 4.14.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
52	72215	Transformers under 5 KVA	NO	8,881	36,254	30,674	34,748	17,778	72,661	296,741	195,501	162,370	117,238
"	72216	Transformers 5 KV and over	NO	2,069	1,194	2,546	4,884	1,146	826,447	2,121,334	2,822,274	2,762,423	1,495,094

Source: Annual Statement of External Trade.
Own elaboration

TABLE 4.15.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
53	72219	Electric goods, other rectifiers etc. nes	T	n.a.	170	173	223	207	n.a.	455,828	735,259	948,115	1,203,570
"	72221	Switch gear for electrical circuits	T	761	1,023	1,069	678	570	1,837,370	2,485,975	2,896,259	1,940,688	1,560,069
"	72229	Electrical apparatus, other	T	n.a.	1,649	1,429	1,278	1,356	n.a.	3,157,462	4,113,860	4,219,343	5,550,682

Source: Annual Statement of External Trade.
Own elaboration

TABLE 4.16

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
57	72911	Cells and batteries, primary, dry	NO	20,163,878	14,949,389	19,736,671	19,231,800	13,986 754	780,915	800,298	819,483	761,242	718,094

Source: Annual Statement of External Trade
Own Elaboration

TABLE 4.17

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
61	69113	Doors, Windows, Iron or Steel Frames	T	n.a.	51	435	320	74	n.a.	26,044	194,220	190,477	84,818
"	69119	Structural iron or Steel work. Other.	T	4,184	7,269	4,412	6,495	2,277	1,071,194	2,200,270	1,080,030	2,446,899	748,639
"	69142	Mine-Head Frames, etc. Iron or Steel	T	n.a.	214	310	75	50	n.a.	195,451	81,899	32,819	17,743
"	69144	Pylons, Masts, Iron or Steel: Elec. Cable	T	n.a	3,074	2,713	6,273	1,915	n a.	748,138	728,112	1,534,866	651,582

Source: Annual Statement of External Trade.
Own Elaboration

TABLE 4.18

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
62	69214	Vats, process tanks, in-											
"	69219	dustrial, other	NO	134	744	2,903	8,984	6,204	219,914	194,706	396,509	437,139	289,206
"	69223	Drums, iron or steel	T	415	291	186	159	148	123,293	85,367	68,315	56,108	52,693
"	69225	Tins, containers, iron or steel	T	1,416	621	352	262	253	734,003	380,073	240,864	172,220	147,911
"	69231	Iron, steel cylinders for compressed gases	NO	8,897	6,578	11,217	4,296	4,300	169,819	134,164	166,433	125,763	79,587

Source: Annual Statement of External Trade
Own Elaboration.

TABLE 4.19

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
63	69311	Wire rope	T	1,464	1,557	1,503	1,055	1,670	555,783	545.205	622,590	549,444	846,340
"	69312	Copper, stranded wire, cable uninsulated	T	1,054	350	87	86	72	590,131	333,951	102,489	114,239	88,880
"	69314	Iron or steel wire, ca- bles, slings, etc.	T	n.a.	971	93	42	47	n.a.	219,280	61,140	47 950	27,928
"	69320	Barbed iron or steel wi- re for fencing	T	1,357	2,779	2,569	638	26	175,217	368,630	439,731	116,123	8,624
"	69331	Gause sieving, iron or steel for machny	T	365	231	228	111	83	213,324	113,952	162,931	83,417	88,029
"	69339	Netting, fencing, etc iron or steel, other	T	27	629	941	216	27	6,610	155,711	275,181	83,087	23,878
"	69352	Welded wire mesh, Iron or steel	T	678	1,817	2,059	563	352	111,056	404,083	383,497	109,064	123,511

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.20

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
64	69411	Tacks, staples, etc. Iron or steel. Nes	T	161	256	442	214	126	67,167	82,413	172,353	95,925	59,084
"	69416	Wire nails, iron or steel	T	56	333	104	41	115	10,426	68,123	34,443	12,293	48,768
"	69421	Bolts, nuts, screws	T	1,878	2,116	3,074	2,767	1,713	686,252	1,095,973	1,905,910	3,500,485	1,395,278

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.21

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
67	69511	Axes and hatchets	NO	22,808	33,479	25,931	62,410	20,180	10,209	19,748	15,378	26,898	12,289
"	69512	Hoes	NO	157,692	557,239	205,997	354,633	99,461	68,574	169,741	57,201	130,083	38,055
"	69513	Picks and pickaxes	NO	4,734	21,738	40,603	116,040	21,803	4,524	12,968	29,434	71,446	15,467
"	69514	Shovels and ballast forks	NO	51,365	37,519	101,169	124,545	42,102	49,600	31,175	87,271	119,711	30,846
"	69515	Sickles	NO	33,816	60,244	28,007	33,021	1,050	7,253	12,450	6,302	13,898	224
"	69516	Spades	NO	560	10,774	9,816	18,365	1,580	389	4,955	9,420	16,398	1,616
"	69519	Hand tools. Agric. other	NO	n.a.	107,686	231,580	124,453	106,959	64,913	47,371	70,020	88,183	73,091
"	69521	Saws. Non-mechanical	T	n.a.	43	25	42	10	n.a.	43,224	70,313	74,068	34,771
"	69522	Pliers, pincers, snips	T	n.a.	490	320	288	263	-	520,673	699,821	869,705	470,055
"	69523	Hand tools. Other Nes	T	n.a.	459	275	366	259	-	501.138	498,104	676,485	455,277
"	69524	Interchangeable tools, other	T	n.a.	195	279	301	257	-	1,045,640	1,252,432	1,655,933	1,450,883
"	69527	Saw-Blades	T	n.a.	41	48	47	19	-	98,997	158,115	168,172	74,384
"	69528	Cutting blades for agric. mining machine	T	n.a.	11	4	6	3	-	72,512	27,983	36,915	22,604

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.22

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
68	69836	Chains for hauling, hoisting, iron, steel	T	821	407	526	338	243	288,568	190,808	228,774	188,201	104,712

Source: Annual Statement of External Trade.
Own Elaboration

TABLE 4.23

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
73	69534	Diamond bits and crowns	T	n.a.	4	10	7	21	-	504,651	502,951	128,099	229,323

Source: Annual Statement of External Trade
Own Elaboration

TABLE 4.24

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
76	71159	IC engine spares and parts	T	n.a	1,520	1,371	1,106	808	n.a.	5,164,743	5,283,824	4,438,415	3,941,168
"	71181	Hydraulic engines	NO	n.a.	7	65	141	15	n.a.	3,291	205,529	1,166,674	15,644
"	71188	Hydraulic engine Parts Water Wheels	T	n.a.	1,244	25	3	376	n.a.	1,961,490	101,408	58,587	325,854

Source: Annual Statement of External Trade
Own Elaboration

TABLE 4.25

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
77	71215 71216	Ploughs. Single mould board	NO	4,118	4,080	2,238	1,085	6,125	87,838	107,674	159,141	105,955	164,808
"	71242	Cultivator, Parts	T	n.a.	n.a.	15	36	6	n.a.	n.a.	12,479	29,123	13,312
"	71243	Harrow, Parts	T	n.a.	n.a.	11	25	47	n.a.	n.a.	14,438	38,066	53,860
"	71244	Planter and seeder, Parts	T	n.a.	n.a.	72	18	2	n.a.	n.a.	67,866	18,643	4,496
"	71245	Ploughs. Single mould board	T										
	71246	Parts	T	74	576	207	325	265	27,477	191,748	108,080	189,575	149,877

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.26

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
78	71510	Machine-Tools for working metal carb	T	n.a.	424	482	548	460	n.a.	720,602	882,290	1,241,847	1.213,160

Source: Annual Statement of External Trade.
Own Elaboration.

TABLE 4.27.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
79	71841	**Road rollers**	NO	n. a.	50	49	45	3	n. a.	244. 615	366. 743	84, 176	64, 403
"	71842	**Excavators**	NO	n. a.	42	234	100	40	n. a.	931, 888	3, 291, 367	3, 430, 586	630, 287
"	71843	Bulldozers, tractor Caterpillar Type	NO	n. a.	41	70	82	36	n. a.	991, 619	1, 581, 268	1, 381, 612	1, 386, 124
"	71844	Graders, scrapers, scarifiers	NO	n. a.	42	176	93	75	n. a.	672, 164	2, 536, 721	1, 403, 921	1, 224, 840
"	71846	Boring, tamping, etc. Machinery, other	NO	-	-	308	412	506	-	-	2, 814, 193	1, 641, 861	2, 588, 944
"	71848	Road roller parts	T	n. a.	18	22	15	1	n. a.	22, 653	28, 582	25, 814	3, 646
"	71849	Parts for excavating Machinery, etc. Nes	T	n. a.	5, 440	3, 780	5, 169	3, 216	-	11, 216, 934	10, 082, 549	12, 261, 983	11, 237, 592
"	71851	Stone ore crushing machinery, etc. other	T	n. a.	3, 397	3, 147	8, 016	3, 289	n. a.	4, 355, 243	3, 697, 924	11, 385, 827	4, 697, 675
"	71859	Castings for 5 tons. ore crushers	T	944	734	479	629	538	438, 699	393, 066	385, 838	495, 032	505, 856
"	71871	Mining machinery, other nes.	T	13, 030	1, 640	-	-	-	12, 103, 533	3, 667, 129	-	-	-

Source: Annual Statement of External Trade
Own elaboration

TABLE Nº 4.28

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
80	71934	Conveyors winches, cranes, etc., nes	T	2,824	3,481	3,505	3,089	2,575	3,303,420	4,154,244	4,437,851	4,934,115	4,582,878
"	71953	Hand tools non-elec. pneumatic, etc. Other.	T	156	233	232	314	248	657,811	861,472	1,236,474	1,499,456	984,342
"	71971	Ball, roller, needle bearing, other.	T	104	307	344	285	250	272,100	684,804	1,200,884	1,023,225	992,246
"	71981	Other industrial machinery nes.	T	n.a.	1,128	831	1,241	518	n.a.	2,054,434	1,347,928	3,322,685	5,290,955
"	71984	Fans, blowers, other.	-	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	326,029	549,901	796,198	312,579
"	71999	Machinery parts non electrical nes.	T	n.a.	561	177	128	297	n.a.	659,247	250,170	206,663	405,170

Source: Annual Statement of External Trade.

Own Elaboration.

TABLE Nº 4.29

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
81	71921	Pumps, other, nes	T	n.a.	1,319	1,271	1,106	1,353	1,965,460	2,757,336	3,406,679	3,415,330	4,238,636
"	71922	Air pumps, other.	T	n.a.	78	30	69	23	418,213	159,483	79,027	189,059	103,590
"	71992	Taps, cocks, valves for pipes, tanks, etc.	T	345	904	1,501	1,766	948	372,687	1,275,059	2,430,571	3,362,844	2,653,305

Source: Annual Statement of External Trade.

Own Elaboration.

TABLE Nº 4.30

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
83	71993 71995	Transmission shafts, for ic engines	T	n.a.	657	980	970	872	n.a.	1, 365, 336	2, 615, 422	3, 009, 558	2, 868, 949

Source: Annual Statement of External Trade.

Own Elaboration

TABLE Nº 4.31

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
84	71991	Moulds for foundry. Plastics, ceramics.	T	n.a.	89	36	62	49	n.a.	155, 193	159, 462	200, 222	204, 137

Source: Annual Statement of External Trade.

Own Elaboration.

5.5.3.4. Description of the Process and List of the Principal Installations

The plant will consist of the following shops:

- Drop forge shop for the following operations:
  Cutting the raw material
  Heating it in fueloil furnaces to 1,000º C
  Drop forging in various phases.
  Punching, trimming, calibrating, straightening.
- Finishing shop and heat treatment for the following operations:
  Grinding
  Drilling
  Straightening
  Shotblasting
  Heat treatments
- Machine shop
- Carpentry shop
- Assembly shop with facilities for:
  Painting
  Attaching handler
- Control department
- Warehouses and shipping
- Die shop
- General services
  Compressed air
  Water
  Electricity
  Fuels
- Technical office and general offices.

TABLE 4.32

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
89	73162	Railway vans, Goods wagons and trucks	NO	n.a.	59	37	317	143	n.a.	86,235	107,927	2,003,012	1,164,749

Source: Annual Statement of External Trade
Own elaboration

TABLE 4.33

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
92	66232	Bricks. Blocks. Tiles, Refractory	NO	2,016,364	1,655,012	3,013,252	1,985,167	3,566,589	1,120,212	1,152,403	2,242,406	1,800,629	3,198,126

Source: Annual Statement of External Trade
Own elaboration

TABLE 4.34

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
94	66231	Bricks-Blocks. Tiles, Heat: Insulating	NO	n.a.	n.a.	55,928	35,612	531,392	n.a.	7,520	7,229	12,623	113,682

Source: Annual Statement of External Trade
Own elaboration

TABLE 4.35.

ANNUAL IMPORTS

Own Code	SITC	Item Description	Unit	Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
95	66311	Millstones, grinding wheels and the like	T	123	n. a.	80	140	63	205, 822	193, 211	145, 091	196, 373	107, 542

Source: Annual Statement of External Trade
Own elaboration

TABLE 4.36.

ANNUAL IMPORTS

Own Code	SITC	Item Description		Quantity					Value (K)				
				1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
96	57112	Dynamite	T	1, 807	984	147	109	4	212, 641	146, 447	20, 289	16, 095	635
"	57113	Gelignite	T	10, 050	6, 598	537	1, 316	72	1, 782, 079	1, 292, 207	105, 608	233, 886	11, 198
"	57114	Dynagel	T	3, 169	3, 013	3, 259	2, 284	7	472, 093	461, 569	524, 860	362, 392	1, 083
"	57119	Prepared Explosives. Other	T	950	3, 702	5, 775	4, 746	2, 628	245, 550	1, 662, 312	2, 014, 474	1, 804, 768	1, 416, 523
"	57121	Mining, Blasting, and Safety Fuses	T	641	573	1, 499	1, 202	736	814, 045	949, 935	1, 071, 589	1, 112, 738	918, 172
"	57122	Detonators	NO	3, 324, 391	3, 088, 461	2, 572, 341	2, 182	2, 477, 417	186, 402	298, 894	249, 831	216, 950	146, 337
"	57124	Igniters	T	218	139	73	90	80	325, 770	197, 314	262, 293	249, 971	160, 157

Source: Annual Statement of External Trade
Own elaboration

TABLE 4.37

RATES OF CUSTOMS DUTY AND SUR-TAX ON GOODS INDICATED IN TABLES 4.4 TO 4.36, AS PERCENTAGE OF THE F.O.B. VALUE

S.I.T.C. Code	1.-Rate of Customs Duty	2.-Rate of Sur-Tax	3.- Total (1 + 2)
57.112	Free	Free	Free
57.113	Free	Free	Free
57.114	Free	Free	Free
57.119	Free	Free	Free
57.121	Free	Free	Free
57.122	Free	Free	Free
57.124	Free	Free	Free
62.105	Free	Free	Free
62.109	Free	Free	Free
62.912	20%	17.50%	37.50%
62.915	20%	17.50%	37.50%
62.949	Free	Free	Free
62.984	Free	Free	Free
66.231	Free	Free	Free
66.232	10%	16.25%	26.25%
66.311	Free	Free	Free
67.120	Free	Free	Free
67.131	Free	Free	Free
67.140	Free	Free	Free
67.151	Free	Free	Free
67.152	Free	Free	Free
67.159	Free	Free	Free
67.254	Free	Free	Free
67.271	Free	Free	Free
67.311	Free	Free	Free
67.321	Free	Free	Free
67.324	Free	Free	Free
67.341	Free	Free	Free
67.411	Free	Free	Free
67.414	Free	Free	Free
67.421	Free	Free	Free
67.429	Free	Free	Free

TABLE 4.37 (Continued)

S.I.T.C. Code	1. Rate of Customs Duty	2. Rate of Sur-Tax	3. Total (1 + 2)
67.470	Free	Free	Free
67.485	30%	18.75%	48.75%
67.486	30%	18.75%	48.75%
67.488	30%	18.75%	48.75%
67.489	Free	Free	Free
67.501	Free	Free	Free
67.611	Free	Free	Free
67.612	Free	Free	Free
67.621	Free	Free	Free
67.629	Free	Free	Free
67.701	Free	Free	Free
67 709	Free	Free	Free
67.811	?	?	?
67.819	10%	16.25%	26.25%
67.839	10%	16.25%	26.25%
67.851	25%	18.125%	43.125%
67.859	25%	18.125%	43.125%
68.221	Free	Free	Free
68.222	Free	Free	Free
68.225	Free	Free	Free
68.226	Free	Free	Free
68.229	Free	Free	Free
68.235	Free	Free	Free
69.113	Various	Various	Various
69.119	25%	18.125%	43.125%
69.142	Free	Free	Free
69.144	Free	Free	Free
69.214	?	?	?
69.219	5%	15.625%	20.625%
69.223	Free	Free	Free
69.225	Free	Free	Free
69.231	Free	Free	Free
69.311	Free	Free	Free

TABLE 4.37 (Continued)

S.I.T.C. Code	1. Rate of Customs Duty	2. Rate of Sur Tax	3. Total (1 + 2)
69.312	Free	Free	Free
69.314	Free	Free	Free
69.320	20%	17.50%	37.50%
69.331	10%	16.25%	26.25%
69.339	20%	17.50%	37.50%
69.352	10%	16.25%	26.25%
69.411	Free	Free	Free
69.416	15%	16.875%	31.875%
69.421	Free	Free	Free
69.511	Free	Free	Free
69.512	Free	Free	Free
69.513	Free	Free	Free
69.514	Free	Free	Free
69.515	Free	Free	Free
69.516	Free	Free	Free
69.519	Free	Free	Free
69.521	Free	Free	Free
69.522	Free	Free	Free
69.523	Free	Free	Free
69.524	Free	Free	Free
69.527	Free	Free	Free
69.528	Free	Free	Free
69.534	5%	15.6125%	20.625%
69.836	Free	Free	Free
71.159	10%	16.25%	26.25%
71.188	5%	15.625%	20.625%
71.215	Free	Free	Free
71.216	Free	Free	Free
71.242	Free	Free	Free
71.243	Free	Free	Free
71.244	Free	Free	Free
71.245	Free	Free	Free

TABLE 4.37 (Continued)

S.I.T.C. Code	1. Rate of Customs Duty	2. Rate of Sur-Tax	3. Total (1 + 2)
71.246	Free	Free	Free
71.510	5%	15.625%	20.625%
71.841	5%	15.625%	20.625%
71.842	5%	15.625%	20.625%
71.843	5%	15.625%	20.625%
71.844	5%	15.625%	20.625%
71.846	5%	15.625%	20.625%
71.848	5%	15.625%	20.625%
71.849	5%	15.625%	20.625%
71.851	10%	16.25%	26.25%
71.859	?	?	?
71.871	?	?	?
71.921	Free	Free	Free
71.922	5%	15.625%	20.625%
71.934	15%	16.875%	31.875%
71.953	5%	15.625%	20.625%
71.971	Free	Free	Free
71.981	10%	16.25%	26.25%
71.984	5%	15.625%	20.625%
71.991	5%	15.625%	20.625%
71.992	Free	Free	Free
71.993	10%	16.25%	26.25%
71.995	Free	Free	Free
71.999	Free	Free	Free
72.211	5%	15.625%	20.625%
72.212	5%	15.625%	20.625%
72.213	5%	15.625%	20.625%
72.214	5%	15.625%	20.625%
72.215	5%	15.625%	20.625%
72.216	5%	15.625%	20.625%
72.219	5%	15.625%	20.625%
72.221	5%	15.625%	20.625%
72.229	5%	15.625%	20.625%
72.310	Free	Free	Free
72.911	Free	Free	Free
73.162	Free	Free	Free

TABLE Nº 4.38

ANNUAL PURCHASING FIGURES FOR NCCM

Own Code	Manufacture	Annual Value K
31	Piping Hose	598,000
33	Belting Rubber	589,337
33	Transmission Belts	114,000
41	Piping Steel	418,000
64	Bolts	196,000
67	Hand Tools	229,000
69	Rollers	244,000
73	Crown Diamonds	948,000
80	Valves	453,000
81	Impellers	457,000
92	Chromium Magnesite Refractories	2,225,000

TABLE 4.39

ANNUAL IMPORT SUBSTITUTION FIGURES FOR RCM

Own Code	Manufacture	Annual Value K
13	Wire Bar Cores	70,000
23	Junction Boxes	60,000
24	Brake Shoes-Loco/Rolling Stock	30,000
29	Hollow Screw Clampe	60,000
34	Pumps Components-Rubber	30,000
36	Underground Support Insulators	37,500
41	Pipes (Other Type) Lancing Pipes	120,000
42	Alvenious Pipes	480,000
55	Electric Light Bulbs	85,000
64	Nuts and Bolts	170,000
65	Nut-Hex Standard (Large)	14,000
66	Roof Bolts-Expansion Shells/Studs	150,000
70	Belt Fasteners	90,000
71	Air Cylinders	200,000
72	Rock Drill Spares	1,300,000
86	Components Gyratory Crushers	150,000
96	Explosive Accesories	500,000

TABLE 4.40

CONSUMPTION IN THE CEMENT INDUSTRY

Own Code	Manufacture	Annual Consumption
26	Balls	500 t
27	Liners	360 t
28	Cylpebs Carbon Steel	360 t
"	" High Chrome Steel	365 t

TABLE 4.41

PREDICTED IMPORT DEMAND FOR 1980 AND 1985

Own Code	Description	Unit	Forecast Demand	
			1980	1985
1	Metallic Products			
11	Pig Iron and Ferroalloys	-	-	-
12	Steel Products (67321 and 67341 SITC Code)	t	64,000	78 000
13	Wire Bar Cores	1,000 K	219 (1)	247 (1)
14	Copper Products (Wire, Tubes, Pipes, etc)	-	-	-
15	Extrusion Products	-	-	-
2	Casting Products			
21	Pump Castings	-	-	-
22	Non Ferrous Metals Cost	-	-	-
23	Junction Boxes - Elect (Cast - Alum)	1,000 K	187 (1)	212 (1)
24	Brake Shoes-Loco/Rolling Stock	1,000 K	94 (1)	106 (1)
25	Symons Crusher-Liners	-	-	-
26	Balls (Cement Industry)	t	775	1,100
27	Liners (Cement Industry and Other)	t	625	900
28	Cylpebs (Cement Industry)	t	1,125	1,600
29	Hollow Screw Clamps	1,000 K	187 (1)	212 (1)
3	Rubber Synthetic Products			
31	Piping Hose	t	480	540
32	Retreading of Tyres (62912 SITC Code)	t	3,250	3,675
33	Rubber Belts	-	-	-
34	Pump Components-Rubber	1,000 K	427	520
35	Polyester Resin Products	-	-	-
36	Underground Support Insulators	1,000 K	117 (1)	132 (1)

(1) Forecast import substitutions.

The number of work lines depends on the program chosen. Each line takes in the fabrication of similar pieces requiring a similar number of operations. In principle, three stamping lines are proposed.

The machinery in each shop would consist of:

- Drop forge shop:
  Cutting saws
  Fueloil heating furnaces
  Stamping presses from 500 to 1,000 t
  Punch presses from 90 to 160 t
  Stripping presses from 90 to 150 t
  Friction presses for quoining

- Finishing shop:
  Grinders
  Drills
  Trommel shot blasting
  Straightening press
  Polishers

- Machine shop:
  Machines, special tools for tooling up for mass production
  Turret lathes
  Milling machines.

- Die shop:
  Milling machines
  Copying millers
  Lathe
  Shaping machine
  Refacers
  Drill
  Saw
  Sharpener
  Spark erosion machine.

TABLE 4.41 (Continued)

Own Code	Description	Unit	Forecast Demand	
			1980	1985
4	Piping			
41	Pipes (Lancing Pipe)	1,000 K	375 (1)	425 (1)
42	Alvenious Pipes	1,000 K	1,500 (1)	1,700 (1)
43	PVC Plastic Rigid Tubes	-	-	-
5	Electric Components			
51	Electric Motors	-	-	-
52	Transformers	-	-	-
53	Electric Material	-	-	-
54	Resistances/Electric Locomotives	-	-	-
55	Electric Light Bulbs	1,000 K	265	300
56	Cells and Batteries	-	-	-
6-7-8	Assembled Components			
61	Assembled Steel	t	12,500	15,250
62	Containers	-	-	-
63	Wire Products	-	-	-
64	Nuts and Bolts (69421 SITC Code)	t	3,300	4,000
65	Nuts - Hex Standard (Large)	1,000 K	44 (1)	50 (1)
66	Roof Bolts - Expansion Shelf/Studs	1,000 K	470 (1)	530 (1)
67	Hand Tools (2)	1,000 K	3,500	4,250
68	Chains	-	-	-
69	Conveyor Idlers, Rollers Idler Bases, Pulleys	1,000 K	696	792
70	Belt Fasteners	1,000 K	280 (1)	320 (1)
71	Air Cylinders (Pneumatic)	1,000 K	625 (1)	700 (1)

(1) Forecast import substitutions
(2) Excluded 69521, 69524, 69527 and 69528 SITC Code.

TABLE 4.41 (Continued)

Own Code	Description	Unit	Forecast Demand	
			1980	1985
72	Rock Drill Spares	1,000 K	4,050 (1)	4,600 (1)
73	Diamond Bits and Crowns	-	-	-
74	Gyrex Screening	-	-	-
75	Open Mesh/Grid Flooring	-	-	-
76	Power Generation Machinery (other than electric) Parts	t	2,250	2,750
76	Power Generation Machinery (other than electric) Parts	K'million	12.6	15.3
77	Agricultural Machinery	1,000 K	875	1,125
78	Machine - Tools	t	785	1,150
79	Machines for Mining and Construction (Item 71841 to 71846)	K'million	15.8	17.9
79	Id. Spare Parts (Items 71848 to 71859)	t	11,500	13,000
79	Id. Spare Parts (Items 71848 to 71859)	K'million	35.3	40.0
80	Machinery and Machine Parts	t	6,100	6,900
80	Machinery and Machine Parts	K'million	21.0	23.7
81	Pumps and Valves	t	3,625	4,400
81	Pumps and Valves	K'million	13.6	16.6
82	Impellers	1,000 K	950	1,075
83	Gears	-	-	-
84	Moulds, Dies	-	-	-
85	Components 150 RB Shovel/BE 40 Drill	-	-	-
86	Components Gyratory Crushers	1,000 K	470 (1)	530 (1)
87	Main Frames-Symons Crushers	-	-	-
88	Loco/Rolling Stock	-	-	-
89	Railway Vans, Wagons and Trucks	-	-	-

(1) Forecast import substitutions.

TABLE 4.41 (Continued)

Own Code	Description	Unit	Forecast Demand	
			1980	1985
9	Others			
91	Moulds Wash	-	-	-
92	Refractory Bricks	-	10,580	12,080
93	Refractory Cements	-	-	-
94	Heat Insulating Bricks	-	-	-
95	Grinding Wheels	-	-	-
96	Explosives	t	-	-
96	Explosive Accessories	1,000 K	1,560 (1)	1,770 (1)

(1) Forecast import substitutions.

TABLE 4.42

GROSS DOMESTIC PRODUCT BY KIND OF MANUFACTURING IN PRODUCERS' VALUES AT CURRENT PRICES (K'million) (1)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	Δ 1965-74 (%)
Food Manufacturing	6.6	7.7	7.4	10.8	14.5	17.5	20.4	96.7	114.1	126.7	546
Beverages and Tobacco	13.0	20.7	25.8	42.6	43.2	51.6	56.4				
Textiles and Wearing Apparel	3.9	4.6	8.3	7.0	9.7	10.7	10.0	13.5	15.4	15.5	297
Wood and Wood Products, including Furniture	2.4	3.6	2.8	2.3	5.0	5.0	3.3	4.7	5.0	8.0	233
Paper, paper products, printing and publishing	2.1	2.5	3.6	5.3	4.1	4.5	5.4	6.5	6.6	10.0	376
Rubber products	0.8	0.9	1.4	1.5	2.9	3.2	4.9				
Chemicals, chemical, petroleum and plastic products	2.8	3.5	6.0	6.4	8.8	6.3	6.5	20.5	27.9	33.4	882
Non-metallic mineral products	6.1	6.3	7.0	7.7	7.5	10.6	9.5	10.1	10.2	10.2	67
Basic-metal products (2)	4.5	5.7	5.4	5.2	2.4	2.5	2.2	3.1	3.3	5.3	18
Fabricated Metal Products, Machinery and Equipment	5.7	13.2	17.9	16.6	15.4	15.2	23.0	26.7	27.2	32.6	472
Other Manufacturing Industries	0.1	0.3	0.5	0.4	0.4	0.3	0.4	0.2	0.3	0.3	200
TOTAL	48.0	69.0	86.1	105.8	113.9	127.4	142.0	182.0	210.0	242.0	404

(1) 1973 and 1974, provisional.
(2) Excluding copper refining.
Source: Central Statistical Office, Lusaka.

TABLE 4.4

GROSS DOMESTIC PRODUCT BY KIND OF MANUFACTURING IN PRODUCERS VALUES AT CONSTANT 1965 PRICES (K million)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	Δ 1965-74 (%)
Food manufacturing	6.6	6.6	6.1	8.1	10.4	12.2	13.4	46.9	51.9	57.1	191
Beverages and tobacco	13.0	17.4	18.5	24.0	22.6	27.5	27.2				
Textiles and wearing apparel	3.9	3.9	7.0	5.5	7.0	7.6	7.1	9.3	10.4	10.2	162
Wood and wood products, including Furniture	2.4	3.0	2.3	1.9	4.0	3.9	2.5	3.6	3.7	6.0	150
Paper, paper products, publishing and printing	2.1	2.1	3.0	4.3	3.0	3.2	3.8	4.2	4.2	4.8	129
Rubber products	0.8	0.8	1.1	1.2	2.3	2.5	3.8	15.8	21.0	22.0	511
Chemicals, chemical, petroleum, plastic products	2.8	2.9	4.9	5.3	7.1	5.0	5.1				
Non-metallic mineral products	6.1	5.1	5.1	5.5	4.9	6.7	6.0	6.3	6.3	6.3	3
Basic metal products (2)	4.5	4.6	4.3	3.9	1.6	1.6	1.4	1.7	1.8	3.0	-33
Fabricated metal products, machinery and equipment	5.7	10.8	14.2	12.7	11.0	10.6	15.0	16.1	15.9	18.4	222
Other manufacturing	0.1	0.3	0.3	0.3	0.3	0.2	0.3	0.1	0.2	0.2	100
TOTAL	48.0	57.5	66.8	72.7	74.2	81.0	85.6	104.0	115.4	128.0	167

(1) 1973 and 1974, provisional.
(2) Excluding copper refining.
Source Central Statistical Office, Lusaka

TABLE 4.44

MANUFACTURING ESTABLISHMENTS BY NUMBER OF WORKERS. OCTOBER, 1973

Industrial Branch	1-49	50-99	100-199	200-499	500 plus	Total Establishments	Total workers
Food, beverage and tobacco	73	21	6	13	3	116	9,898
Textiles, wearing apparel and leather	83	17	8	7	3	118	8,306
Wood and wood products including Furniture	33	5	5	2	1	46	3,305
Paper, paper products, publishing and printing	30	4	4	1	-	39	1,574
Chemicals, petroleum, plastics and rubber	28	6	4	5	3	46	5,123
Non-metallic mineral products	23	7	5	5	-	40	3,623
Basic metal products (1)	2	2	-	-	1	5	849
Fabricated metal products, machinery and equipment	93	27	16	3	1	140	7,762
Other manufacturing industries	10	1	-	-	-	11	197
TOTAL	375	90	45	36	12	561	40,637
Percentage	66.9	16.-	8.6	6.4	2.1	100	-

(1) Excluding copper refining

Source: Ministry of Commerce. Manufacturing and Employment at October, 1973

TABLE 4.45

BASIC METAL AND FABRICATED METAL, MACHINERY AND EQUIPMENT INDUSTRIES.
MANUFACTURING ESTABLISHMENTS BY NUMBER OF WORKERS, OCTOBER, 1973

	1-19	20-49	50-99	100-199	200-499	500 plus	Total Establishments	Total workers
Basic metal industries (1)								
Iron and steel basic industries	1	-	1	-	-	1	3	783
Non-ferrous refineries not included in mining	1	-	1	-			2	66
Total	2	-	2	-	-	1	5	849
Percentage	40		40	-		20	100	-
Fabricated metal, machinery and equipment industries								
Cutlery, hand tools, hardware	1	1	2	-			4	219
Structural metal products	9	13	10	3	1	1	37	2 634
Fabricated metal products	10	8	7	3			28	1 320
Engines and turbines	-	1	-	-			1	43
Welding	-	2	-	-			2	79
Special industrial machinery	2	3	1	-		-	6	193
Electrical industrial machinery	2	6	2	1	-	-	11	536
Electrical apparatus	-	3	1	1	-	-	5	395
Construction engineering	-	1	-	-	-	-	1	21
Other (metal furniture radio, tv, aircraft repair, motor vehicle assembling, optical instruments, etc.).	26	5	4	8	2	-	45	2, 322
Total	50	43	27	16	3	1	140	7, 762
Percentage	35.7	30.7	19.3	11.4	2.2	0.7	100	-
GRAND TOTAL	52	43	29	16	3	2	145	8, 611

(1) Excluding copper refining.

Source. Ministry of Commerce. Manufacturing and Employment at October, 1973.

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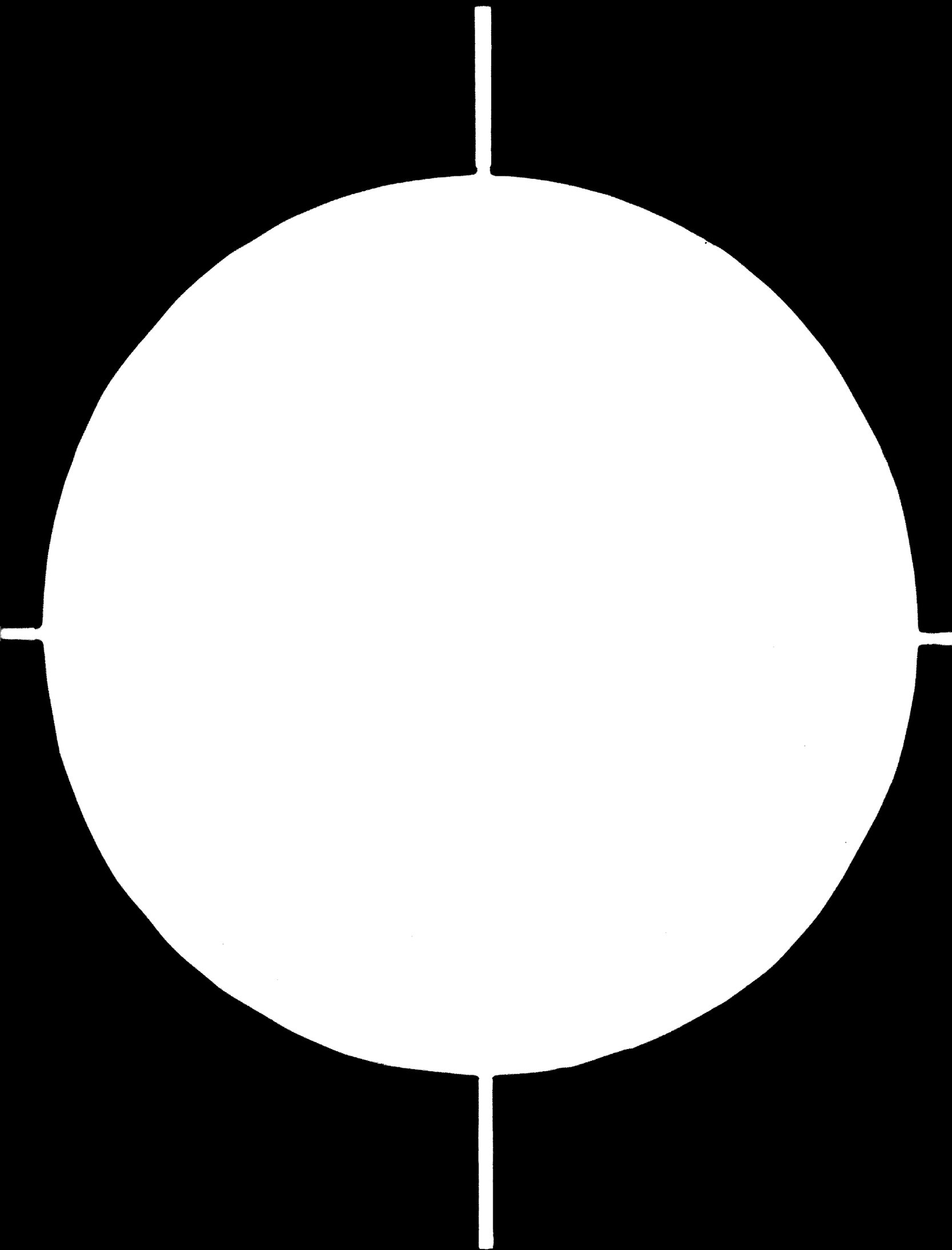

TABLE 5.9

NEW REGISTRATIONS OF MOTOR VEHICLES

	New Vehicles							Vehicles used elsewhere (1)
		Vehicles for passenger transport		Vehicles for goods transport				
	Total New vehicles	Passenger cars	Omnibuses	Vans, vannetes and ambulances.	Trucks and mechanical horses	Construction vehicles, tractors etc.	Motor cycles and scooters	Total
1964	8,473	5,647	15	1,480	445	362	524	2,752
1965	11,379	6,366	28	2,686	1,092	479	728	2,401
1966	10,477	4,510	37	2,374	1,773	660	1,123	1,823
1967	14,344	6,558	71	3,430	1,874	649	1,762	1,483
1968	14,938	7,240	36	3,364	1,707	394	2,197	1,543
1969	13,352	6,246	86	3,441	1,356	541	1,682	1,908
1970	13,530	5,984	54	3,743	1,470	622	1,657	1,851
1971	16,180	6,165	152	5,042	2,349	854	1,618	1,389
1972	14,541	5,539	274	4,321	1,747	836	1,824	507
1973	12,704	5,221	304	3,505	1,654	707	1,313	653
1974 January-June.	7,263	3,056	134	1,877	1,244	414	538	318

(1) Vehicles previously registered outside Zambia but brought into the country and re-registered.

Source: Central Statistical Office, Lusaka.

ANNEX 2

DATA ON THE WORKSHOPS AND WAREHOUSES OF THE MINES AND CEMENT INDUSTRIES VISITED IN ZAMBIA

1. GENERAL DATA

1.1 Name of the Company: Roan Consolidated Mines Limited

1.2. Location: Ndola

2. SHOPS

2.1 Name and position of the persons interviewed Mr A McCririck

2.2. Installations and machinery

Electrical maintenance shop

Mechanical maintenance shop lathe, drill, electric and autogenous welding.

Technical office

2.4 Critical judgment They are very small shops with little machinery that can only make or repair small pieces

The technical office is very limited

3 WAREHOUSES

3.1 Name and position of the persons interviewed Mr A McCririck

3.2 Materials and origin Materials destined to the tank house installation Limited number of items made in Zambia, such as cast pieces or acid resistant material, etc The rest is imported

3.3 Critical judgment A warehouse of little importance, compared with those in other mining divisions, since it is limited to parts for the tank house

1. GENERAL DATA

1.1. Name of the Company: Roan Consolidated Mines Ltd.

1.2. Location: Mufulira

2. SHOPS

2.1. Name and position of the persons interviewed: Mr. Swain, Divisional Engineer.

2.2. Installations and machinery: Shovel maintenance shop in the mine (underground).
Machine shop: lathes, drills,
Boiler shop
Forge shop
Foundry
Electric shop.

2.3. Personnel: Only one shift works
Machine shop, some 30 workers
Boiler shop, some 40 workers
Forge shop, some 25 workers
Foundry, some three workers.

2.4. Critical Judgment: The machine shops and boiler shops are well equipped.
The forge shop does not handle technical treatments.
The foundry is small.
They are generally well equipped and work in maintenance, except in emergency cases when they cannot obtain the spare part or have it made in local shops.
They are working below capacity, for they only have personnel for one shift.

3. WAREHOUSES

3.1. Name and position of the persons interviewed: Mr. G.B. Goffey, Stores Administrator.

The value of the materials in the warehouse is of some 18 million K, distributed as follows:

Mining material	3.5	
Electrical power and workshop engineer	2	
Concentrator	1.4	
Smelting	3.6	(of these, 2 in chromium-magnesite refractories)
Refinery	1.5	
General Stocks	6	
	18.0 M K	

They have sufficient stock for seven months use. They have repair difficulties because of supply delays caused by transport from the ports to Zambia.

The total number of items in the warehouses of the Mufulira Division is 42,000 and of all of RCM some 200,000. Stock control, high and low, is handled by computers. They import 5 to 6 million K from Europe, 1.5 to 2 MK from R.S.A. There is a tendency to reduce purchases from this latter country. As for the U.S.A., it is very difficult to buy there.

Zambia provides a value of 4 MK without including fueloil and other liquid fuels.

3.3. Critical Judgment: Very important warehouses with a good control office and adequate personnel. Neverheless, it does not seem as if they have done much to investigate and try out the substitution of imported spare parts with spares made in Zambia.

1. GENERAL DATA

1.1. Name of the Company: Roan Consolidated Mines, Ltd.

1.2. Location: Luanshya.

2. SHOPS

2.1. Name and position of the persons interviewed: Mr. Mckie, Work Shop Engineer.

2.2. Installations and machinery:

Shop for repairing shovels and mining machinery. Forge shop, for small pieces. They also have heat treatment.
Construction shop:
Boiler shop: benders, shears, welding, continuous, etc.
Machine shop: millers, lathes, boring machines, etc.
Locomotive repair shop:
Electric shop:
Foundry: Electric furnace, 2.5 t. Crucible molding furnace.

2.3. Personnel

Carpenter shop	30
Construction shop	30
Boiler shop	52
Machine shop	37
Foundry	16
Total	165

2.4. Critical Judgment: Very well equipped machine and boiler shops with large machines but very low utilization due to lack of personnel.

The shovel maintenance shop is excellent. The shops normally only handle maintenance work.

3. WAREHOUSES

3.1. Name and position of the persons interviewed: Mr. R. Calisle. Stores Administrator.

3.2. Materials and origin: The value of the products in the warehouse is 21 MK. The number of items in the warehouse is 42,000. They have begun to investigate and try to substitute imported spare parts with spares manufactured in Zambia. In numerous cases the prices of the pieces manufactured in Zambia are lower than the imported ones.

They estimate that 60% of the spare parts for mining machinery could be constructed in Zambia. The difficulties that exist are caused by the fact that the shops in Zambia do not have adequate technical operators or matallurgical quality control, heat treatment, etc.

3.3. Critical Judgment: Very important warehouses with a good control office and qualified personnel. They are doing good work to find out the possibilities of substituting imports.

1. GENERAL DATA

1.1. Name of the Company: Nachanga Consolidated Copper Mines Ltd.

1.2. Location: Rokana

2. SHOPS

2.1. Name and position of the persons interviewed: Mr. G.P. Park, Sectional Eng. Workshops.

2.2. Installations and machinery: Machine Shop: lathes, drills, etc.
Boiler Shop.
Forge Shop.
Foundry: Two 1 1/2 t smelting furnaces. One crucible furnace.

2.3. Personnel: Total of 169 in the shops.

2.4. Critical Judgment: Well equipped shops but with few fersonnel. For this reason the machines have very low utilization.

3. WAREHOUSES

3.1. Name and position of the persons interviewed: Mr. Jillings, Engineering Superintendent.

3.2. Materials and origin: Very varied material since the Rokana division has concentrator mines, leaching, smelting, and refinery.

3.3. Critical Judgment: A very important warehouse with a large number of import items.

1. GENERAL DATA

1.1. Name of the Company: Nachanga Consolidated Copper Mines Ltd.

1.2. Location: Chingola.

2. SHOPS

2.1. Name and position of the persons interviewed: Mr. R. Burns, Div. Eng. Services.

2.2. Installations and machinery: Boiler shop. Machine shop.

2.3. Personnel: Total 100.

2.4. Critical Judgment: Shops with low utilisation.

3. WAREHOUSES

3.1. Name and position of the persons interviewed: Mr. R. Burns, Div. Eng. Services.

3.2. Materials and origin: Diverse materials since this division has concentrator mine and leaching plant.

1. GENERAL DATA

1.1. Name of the Company: Chilanga Cement Ltd.

1.2. Division: Chilanga.

2. SHOPS

2.1. Name and position of persons interviewed: Mr. O.D.Z. Chama, General Manager. Mr. G. Stevens, Works Manager.

2.2. Installations and machinery: Machine shop: lathes, drill, planer, Boiler shop: shears, bending machine.

2.4. Critical Judgment: A very small shop, with little and old machinery.

3. WAREHOUSES

3.1. Name and position of persons interviewed: Same as the ones in the shops.

3.3. Critical Judgment: Small size warehouse compared to the ones in the mines and with a much lower number of items.

ESTIMATED OUTPUT OF ENGINEERING TECHNICIANS AND TECHNOLOGISTS

Programme	1975	1976	1977	1978	1979	1980	Total
Industrial Science Technicians	[illegible]	[illegible]	[illegible]	[illegible]	20	20	151
Electronics Technicians	11	18	20	[illegible]	21	21	112
Telecommunication Technicians		[illegible]	[illegible]		[illegible]	25	95
Electrical Technicians	56	[illegible]	70	[illegible]	105	105	484
Mechanical Technicians	39	[illegible]	[illegible]	[illegible]	80	80	378
Automotive Technicians		20		[illegible]	50	60	180
Structural/Fab. Technicians	[illegible]		[illegible]	[illegible]	25	25	127
Process Instrument Technicians	-	22	[illegible]	[illegible]	24	24	118
Survey Technicians	[illegible]						28
Architecture/Building Technicians	9			-		-	9
Construction Technicians		-		[illegible]	[illegible]	35	130
Mining Technicians	33	[illegible]			[illegible]	20	113
Mining Metallurgy Technicians	[illegible]	[illegible]		[illegible]	[illegible]	22	110
Mining Survey Technicians	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	106
Mining Ventilation Technicians	[illegible]	[illegible]	8	[illegible]	[illegible]	14	73
Computer Programming Technicians		[illegible]	[illegible]		[illegible]	25	101
Sub Total	228	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2275
Mechanical Technologists	[illegible]	[illegible]				[illegible]	129
Industrial Science Technologists	[illegible]					12	62
Electronics Technologists		[illegible]			[illegible]	11	55
Telecommunications Technologists	10				[illegible]	15	62
Electrical Technologists	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	92
Process Instrument Technologists					9	10	19
Civil Technologists		[illegible]					9
Survey Technologists						-	10
Architecture Technologists							
Building Technologists						-	7
Architecture/Building Technologists		[illegible]				-	10
Construction Technologists				[illegible]	[illegible]	20	50
Sub-Total	[illegible]	[illegible]	[illegible]	88	108	118	505
Grand-Total	[illegible]	388	[illegible]	[illegible]	[illegible]	[illegible]	2,780

Source:
Development and Planning Section, Department of Technical Education and Vocational **Training**.

ANNEX - 3

DATA ON THE MANUFACTURING ESTABLISHMENTS VISITED IN ZAMBIA

SUMMARY OF MANUFACTURING ESTABLISHMENTS VISITED

Name of Company	Principal activity	Type of products per Tecniberia classification
Zamefa	Non ferrous metal extrusion	1. Metallic products
Scaw	Iron castings	2. Casting and forging pro.
Vulcan	" "	" " "
Foundry Engineering	Non ferrous castings	" " "
Demar	Forging	" " "
Tesolin Darioli Enginee.	Metallic piping	3. Piping and fitting
Hume	Metallic and concrete piping	" "
Zambia Steel	Metallic and PVC piping	" "
Piggot Maskew	Rubber products	4. Rubber, synthetic products
Prodorite	Fiberglass and acid resistant products	" " "
South Wales	Transformers	5. Electric components
Cutler Hammer Igranic	Electric panels	" "
Diacarb	Large scale machining and drilling spares	6.7.8. Assembled products
Atlas Copco	Mining equipment spares	" "
SKF	Medium scale machining	" "
CP Engineering	Machining of misc. parts	" "
Congar	" " "	" "
Roan (Leco)	Machining of misc. parts and heavy boiler steel	" "
Copperbelt Steel	Heavy boiler steel	" "
Refrigeration fabricators	Light boiler steel	" "
Lenco	" " "	" "
B M S	" " "	" "
African Wire Ropes	Mechanical cables	9. Others
A W Construction	Chains	"
Cullinan	Cement refractories	"

1. GENERAL DATA

1.1. Name of the Company: Zamefa

1.2. Location: Luanshya

1.3. Name and position of the persons interviewed: Mr. D.E. Harvey, General Manager. Mr. Sankara Raman, Technical Manager.

1.4. Other data: This company is 51% owned by Indeco and the rest by Philips Dodge Corporation (U.S.A.) and others.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Manufacture of electric cable. Non ferrous metal extrusion.

2.2. Range of production: Unarmoured PVC cables. Armoured PVC cables. Cables (up to 3 KV and 185 sg. mm). Telephone cables.
Copper: strips, section wire.
Aluminium sections.

2.4. Utilisation of capacity: They are operating at 50% of capacity in some sections.

3. RESOURCES

3.1. Installations and machinery: They have the following facilities:
Extrusion.
Wire drawing
Conductor stranding
Insulating
Laying up
Armouring
Final Sheathing
Testing

3.2. Personnel: 356

3.3. Technology: Philips Dodge (U.S.A.) GRANGES-ESSEM (Sweden).

3.4. Raw Materials: Copper wire bars, aluminium, components for making PVA.

4. IMPORTS

4.1. Items: Aluminium, components for making PV.C.

5. INVOICING

11,689,000 in 1974.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems:

1st) High cost of rail and ship transport and handling, making it impossible for them to compete in exports, except for supplying bordering countries.

2nd) A limited domestic market, making certain improvements in processes unprofitable (such as continuous casting) and other kinds of products.

6.2. Plans: They have the following programmed:

1st) Manufacturing vulcanized cables with PVC insulation for above 3.3 KV, substituting for paper insulated cable which is imported. To make this substitution it is necessary to modify the electrical standards presently in effect in Zambia which limit the use of PVC to 3.3 KV. This increase in production would require an investment of 500,000 to 650,000 K.

2nd) Manufacturing of unvulcanized cables insulated with polyethylene or ethylene propylene. This decision depends on the results of the development studies being conducted by a consulting firm. Planned investment is 1.2 to 1.4 MK.

7. CRITICAL JUDGMENT

This is a well equipped factory with adequate technology.

1. GENERAL DATA

1.1. Name of the Company: Scaw Limited.

1.2. Location: Kitwe.

1.3. Name and position of the persons interviewed: Mr. G.W. Jackson. General Manager Director.

1.4. Other data: Ownership of this company is as follows:

51% to Anglo American
21% to Contractor Holding Zambia
21% to Zambia Anglo-American
7% to others.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Steel and copper foundry

2.2. Range of production: Steel parts, steel balls, manganese steel parts, copper molds.

2.3. Capacity: Balls, 3,000 t/month. Manganese steel, 400 t/month. Normal steel, 600 t/month.

2.4. Utilisation of capacity: Manganese steel 60%. Normal steel 25%

3. RESOURCES

3.1. Installations and machinery: Steel and copper foundry, five furnaces distributed as follows:

Capacity/t	KVA
4	1.8
3	1.2
4	1.7
8	3
8	3

Cast iron foundry, two induction furnaces, 3.5 t, 50 cycles, with an electric installation of 1 MVA.

3.2. Personnel: Total 803, of which 50 are expatriates.

3.4. Raw Materials: Scrap, sand, bentonite.

4. IMPORTS

4.1. Items: Scrap and pig iron.

4.2. Source: South Africa, Brazil, Zaire.

4.3. Value: Before the restriction on imports, 2.5 million K/year
At the present time 79,000 to 140,000 K every 4 months.

5. INVOICING

Before the present crisis, it was 6.2 million K/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Difficulty in importing scrap. Lack of management. Decrease in demand.

6.2. Plans: They have planned and investment of 900,000 K for expanding and improving the installations when the economic situation of the country changes.

7. CRITICAL JUDGMENT

An important industry because of its production, having a high degree of technology for present manufactures. 95% of its output is mass produced items. Its principal clients are NCCM and RCM. The cast iron facility works well below its capacity.

1. GENERAL DATA

1.1. Name of the Company: Vulcan Foundry

1.2. Location: Lusaka

1.3. Name and position of the persons interviewed: Mr. C. E. Branford, Foundry Manager.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Smelting of iron and aluminium

2.2. Range of production: Cast iron, pieces wighing up to 180 kg. They make small repetitive pieces specially, such as access hole or port covers, manhole covers, sump covers, etc.

2.3. Capacity: 112 t/production month

2.4. Utilisation of capacity: Below theoretical value

3. RESOURCES

3.1. Installations and machinery: Preparation of sands, machining, they produce 15 t/h. Mechanized molding shop, with 10 machines. Iron smelting, two smelting pots of 1 and 2 t/hour. Installation for molding and smelting aluminium pieces in a crucible furnace.

3.2. Personnel: Total 103, of whom one expatriate.

3.3. Technology: Their own.

3.4. Raw Materials: Iron scrap, aluminium, coke, bentonite, molding sands.

4. IMPORTS

4.1. Items: Aluminium, coke, bentonite.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Scarcity and high cost of raw materials. Lack of specialized personnel.

6.2. Plans: Under Zambia's present economic conditions, enlarging or imperving the facilities is out of the question.

7. CRITICAL JUDGMENT

Although it has some mechanized installations, this foundry cannot solve the problems of the mining industries for the following reasons:

Deficient smelting facilities
It has no chemical laboratory
It lacks specialized personnel
It lacks pattern moulders.

Nevertheless, if it solved these problems, it could become an auxiliary to the mining industry.

1. GENERAL DATA

1.1. Name of the Company: Foundry Engineering Co. Ltd.

1.2. Location: Luanshya

1.3. Name and position of the persons interviewed: Mr. C.H. Kaunda

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Casting of bronze, brass, and aluminium.

2.2. Range of production: Sand casting, case casting, and centricast of different classes of pieces (valves, etc.).

In centrifuging they make bushings from 50 mm to 300 mm ø and 900 mm long.

2.3. Capacity: Bronze 8 t/month. Aluminium 4 to 5 t/month

3. RESOURCES

3.1. Installations and machinery: 2 crucible: 150 and 300 kg.
1 electric induction furnace
1 centrifuging machine
1 sand mixer

3.2. Personnel: Total 22.

3.3. Technology: Their own

3.4. Raw Materials: Copper and zinc, lead, aluminium, and tin

4. IMPORTS

4.1. Items: Tin and aluminium: Brass molds.

5. INVOICING

146,000 K/year (in 1971)

TABLE 5.2.

OUTPUT FROM TRADE AND VOCATIONAL TRAINING PROGRAMS

TRADE	ACTUAL				PROJECTED					
	1,971	1,972	1,973	1,974	1,975	1,976	1,977	1,978	1,979	1,980
Agricultural Mechanics	0	0	0	16	32	33	45	45	45	45
Automotive repair	47	66	121	118	165	165	180	180	180	180
Bricklaying and Plastering	67	78	48	75	75	75	45	45	45	45
Carpentry and Joinery	55	76	64	66	90	90	45	75	45	75
Clerk typists	27	16	30	54	48	75	60	40	60	60
Electricity	47	66	60	87	90	90	90	90	90	90
Farm Machine Operators	-	-	-	35	0	0	-	-	-	-
Heavy equipment	-	-	36	0	16	15	15	15	15	15
Machinists and Machinists Fitter	-	25	13	67	44	45	30	30	30	30
Metal Fabrication (Light)	-	9	-	-	0	-	-	-	-	-
Metal Fabrication (Heavy)	-	15	19	34	65	60	60	60	60	60
Office equipment repair	-	-	13	-	8	14	15	-	15	-
Painting and Decorating	8	14	14	15	0	30	0	15	15	15
Panel beating	-	-	20	-	30	0	15	15	30	15
Plumbing	55	58	32	56	75	60	75	60	75	60
Power sewing	-	-	12	14	14	14	15	15	15	15
English as foreign language	-	-	-	36	36	36	36	36	36	36
Radio and T.V. repair	12	23	0	0	28	0	30	-	30	-
Shorthand typists	-	17	15	37	90	90	180	220	120	200
Tailoring	4	1	12	0	14	-	15	-	15	-
Welding	18	31	0	0	0	-	-	-	-	-
Wood Machinists	10	13	14	13	15	15	-	15	-	15
TOTAL	350	491	503	717	935	907	951	956	916	956
Accumulative Total		841	1344	2061	2996	3903	4854	5810	6726	7682

Source: Department of Technical Education and Vocational Training.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Present problems: High cost of raw materials. Lack of coordination with the purchasing services of the mining companies.

7. CRITICAL JUDGMENT

It is a poorly equipped foundry, making simple pieces of bronse and aluminium, although it has a bushing centrifuging machine. Nevertheless, one must bear in mind that it is the only bronse foundry in Zambia and could be the basis of future development.

1. GENERAL DATA

1.1. Name of the Company: DEMAR

1.2. Location: Kitwe

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Forge shop.

2.2 Rage of production: Bars, chisels, etc.

3. RESOURCES

3.1. Installations and machinery: 1 Drop hammer.

7. CRITICAL JUDGMENT

A very small, old installation of little interest.

1. GENERAL DATA

1.1. Name of the Company: Tesolin and Darioli Engineering Ltd.

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. Enrico Storti.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: General Steel Fabricators, steel pipes, grating. Sale of valves.

2.2. Range of production: Low pressure pipes from 8" to 24".

2.3. Capacity: Pipe making capacity - 10,000 tons/year.

2.4. Utilisation of capacity: At the present time, they are producing 6,000 tons/year which represents 60% of maximum capacity.

3. RESOURCES

3.1. Installations and machinery: Newly installed shop with bending machines for up to 10 mm thickness, 2,500 mm length, and 405 mm ø. Cutter for sections up to 13 mm, punching machine, radial drill, circular saw. Traveling cranes for 15,18, and 20 t, assemblies.

3.3. Technology: Their own.

3.4. Raw Materials: Steel plate.

4. IMPORTS

4.1. Items: Plate, valves

5. INVOICING

Desirable figure from 250,000 to 300,000 K/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Reduction in demand caused by the situation in copper mining.

6.2. Plans: They have just finished building a new shop. In their opinion, their isn't a large enough market to warrant setting up a plant for continuous pipe welding.

7. CRITICAL JUDGMENT

It is a completely new facility with very ample shops and adequate machinery.

1. GENERAL DATA

1.1. Name of the Company: Hume

1.2. Location: Luanshya

1.3. Name and position of the persons interviewed: Mr. V.J. Evans

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Manufacture of steel and concrete pipe.

2.2. Range of production: Steel pipe 200 to 1,200 mm ϕ.

2.3. Capacity: 700 t/month of steel pipe.

3. RESOURCES

3.1. Installations and machinery: Steel pipe section:

Roll for machines

Seam welders

Guillotines

Pipe treatment

Submerged arc welding sets.

Test rigs

Shot blast machine

Seam form machines

Concrete products section:

Concrete mixer

Vihy vibrator

Pipe spinning benches.

3.2. Personnel: Total 369, 50% in each of the two sections.

3.3. Technology: Their own.

3.4. **Raw Materials**: Steel plate, flanges, electrodes, concrete, etc.

5. **INVOICING**

4,78 MK/year.

6. **PRESENT PROBLEMS AND FUTURE PLANS**

6.1. **Problems**: Technically, they are capable of exporting, but cannot compete with the R.S.A. because of the devaluation of the rand.

6.2. **Plans**: To make pulleys for conveyors.

7. **CRITICAL JUDGMENT**

A well equipped shop capable of greater production than at present.

1. GENERAL DATA

1.1. Name of the Company: Zambia Steel and Galco Division.

1.2. Location: Lusaka.

1.3. Name and position of the persons interviewed: Mr. A.A. Patel, Manager. Mr. S.N. Chatterjee, Divisional Manager, and Mr. S.N. Divwala, Plant Engineer.

1.4. Others: This Company belongs to Chandarias, and Indian Company.

2. ACTIVITIES PRODUCTS AND PRODUCTION

2.1. Activities: PVC pipe. Black and galvanized steel pipe. Corrugated sheet, galvanized. Window sections.

2.2. Range of production: PVC pipe. 8" to 16" ϕ. Steel pipe, 1/2" to 3" ϕ.

2.3. Capacity: PVC pipe, 100 t/month. Steel pipe, 15,000 to 18,000 t/year in three shifts. Corrugated sheet: 16,000 t/year.

2.4. Utilization of capacity: They are working below maximum capacity.

3. RESOURCES

3.1. Installations and machinery

PVC pipe: Extrusion presses

Steel pipe: Facilities for bending and welding, galvanizing.

Galvanizing: Sheet cutting, pickling, galvanizing, and shaping.

3.2. Personnel:

PVC pipe: 32

Steel pipe: 50

Galco Division: 100

3.3. Technology: Chandarias (India)

3.4. Raw materials: Strip steel, sockets and fittings, sheet, PVC components

4. IMPORTS

4.1. Items: Basically, steel strip, sheet, and PVC components.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Decrease in demand. Increase in cost of raw materials. Difficulty in exporting.

7. CRITICAL JUDGMENT

Adequate facilities with good technology. They were being underutilised because of the lack of a market.

Nevertheless they are limited to the manufacture of thin low pressure pipe.

At any rate, fittings are imported.

They have a good basis for expansion to other manufactures.

1. GENERAL DATA

1.1. Name of the Company: Piggot Maskew.

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. Monty Erskine, Managing Director.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Rubber Products.

2.2. Range of production: Rubber linings, seals, couplings, hose, sheeting, anticorrosive coatings, tire recapping.

2.4. Utilization of capacity: Normal.

3. RESOURCES

3.2. Personnel: Total 300; expatriates 20.

3.3. Technology: General (U.S.A.).

3 4. Raw Materials: Rubber, neoprene, etc.

4. IMPORTS

4.1. Items: Rubber, neoprene, etc.

4.3. Value: 836,000 K/year.

5. INVOICING

3 MK/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Import difficulties due to delays caused by transportation problems. These delays of materials waiting in Dar el Salaam result in high charges.

6.2 **Plans**: They are planning to increase the staff to 350 msn. They are interested in increasing the number of recapped wheels especially for large mine vehicles. They do not consider it profitable, because of the low consumption and variety of sizes, to install a production line of V belts or conveyor belts.

7. CRITICAL JUDGMENT

It has adequate installations for the type of products made. It would seem interesting to promote tire repair especially for large mining machines, since this would lenghten their life and save foreign exchange

TABLE 5.3

TRADE TRAINING PROGRAMS

BASIC COURSE	CRAFT COURSE *	INDUSTRIAL TRAINING (1)	
6 Monts	2 Years	1 Year	
FORM III (MINIMUM) — BASIC COURSE: Electricity, Building, Metal Work, Power, Woodwork	Agricultural Mechanics Auto body Mechanics Auto Electrical Auto Mechanical Brickwork Carpentry Electrical Heavy equipment Machinist Fitting Metal Fabrication Office Machine Mechanics Painting & Decorating Plumbing & Sheet Metal Radio & T.V. Repair Wood Machining	INDUSTRY	CRAFTSMAN
FORM III (MINIMUM)	Tailoring		
	OTHER COURSES		
FORM III	Clerk Typing (12-18 Months)	Certificate in C/Typing	
FORM V	Shorthand Typing " "	Certificate in S/Typing	
Grade VII	Power Sewing (12 Months)	Certificate in Power Sewing	

* Intermediate Craft Certificate Awarded

(1) Zambia Craft Certificate Awarded.

1. GENERAL DATA

1.1. Name of the Company: PRODORITE

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. J. K. Shaw. Managing Director.

2. ACTIVITIES

2.1. Activities: Plastics, bricking, anticorrosive products, adhesive cements.

2.2. Range of production: Plastics: PVC and Glass fiber, reinforced. Plastics (G.R.P.) piping, fittings, tanks, electrical conduit, roof sheets.
Bricking: Acid, refractoring, water proofing.
Anticorrosives: G.R.P., electrolitic cells, launders, tanks.
Adhesive cements: epoxy, vinyl, etc.

2.3. Capacity: 80% goes to the copper industry and the rest to the construction industry.

3. RESOURCES

3.1. Installations and machinery: Bricking facilities, G.R.P., PVC adhesive cements.

4. IMPORTS

4.1. Items: All raw materials.

4.2. Source: Japan, France, etc.

5. INVOICING

1.5 MK in 1974.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. **Problems**: Restriction and delay in receiving imported raw materials.

6.2. **Plans**: They are planning to double plant size, but the economic condition of the country is not favorable for this expansion.

7. CRITICAL JUDGMENT

Average industry suitable for the products it makes.

1. GENERAL DATA

1.1. Name of the Company: South Wales.

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed:
Mr. Craven, Works Manager.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Construction and repair of electric transformers.

2.2. Range of production: Transformers from 100 to 500 KVA with voltage up to 11 KV.

2.3. Capacity: Construction, 130 transformers of different types every four months. Repair, two per week.

2.4. Utilization of capacity: They work only one shift daily, five days per week. At the present time, part of the production is stored.

3. RESOURCES

3.1. Installations and machinery: Magnetic plate preparation shop. Assembly shop, repair shop, testing shop.

3.2. Personnel: Total 47; of these, five in management; three expatriates.

3.3. Technology: Brush Transformer LTD (UK).

3.4. Raw Materials: Paper insulated copper wire, magnetic plate and tank these latter are manufactured by Copperbelt Steel.

4. IMPORTS

4.1. Items: Basically magnetic plate and paper insulated copper wire.

4.3. Value: 570,000 K/year

5. INVOICING

The desirable invoicing figure overall for construction and repair is 120,000 K/month. 32% of this sum represents the value of imports. Added value is 50%.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Reduced demand due to the situation in copper mining. Difficulty in transporting imported materials because of the closing of the port of Lobito. Increased cost of imported materials.

6.2. Plans: The possibility of increasing the range of production above 500 KVA is limited by the economic policy of the Company, since it is presently cheaper to import these transformers from South Africa rather than construct them in Zambia. Technically, it would be posible to build transformers up to 2,000 KVA.

7. CRITICAL JUDGMENT

A modest industry which up to now has only produced transformers up to 500 KVA. Most of them are not destined to the mining industry.

It is an underutilised work base.

At is an industry capable of expansion, since only one shift works.

They can also go as high as 2,000 KVA, thus increasing their supplier to industry.

Problems are caused by raw materials which depend completely on imports.

Production per man is 11.420 K/year, a low figure considering the high cost of raw materials.

This means that the manpower cost is low.

1. GENERAL DATA

1.1. Name of the Company: Cutler Hammer Igranic Ltd.

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. O.E. Cole, General Manager.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Assembly of electrical panels. Assembly of electric installations.

3. RESOURCES

3.1. Installations and machinery: Assembly shop with small machines.

3.2. Personnel: Total 58. Expatriates 7.

3.4. Raw Materials: Panels built by Refrigerator, cables supplied by Zamefa, switches, small transformers, electric accessories in general.

4. IMPORTS

4.1. Items: Small transformers, switches, general accessoriss, copper strips with drills.

4.3. Value: 600,000 K/year

5. INVOICING

1 KM/year

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Difficulties caused by import restrictions.

7. CRITICAL JUDGMENT

A small shop with little machinery.

1. GENERAL DATA

1.1. Name of the Company: Diacarb

1.2. Location: Ndola

1.3. Name and position of the persons interviewed: Mr. J.L. Barton. Chief Stores Controller.

1.4. Other data: Society of the Anglo-American group.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Manufacture of sounding drills. Diamond fitting. Manufacture of drilling rods. Bar coupling, extension rod. Repair of drilling machinery.

2.4. Utilization of capacity: They work two out of three possible shifts.

3. RESOURCES

3.1. Installations and machinery: Diamond fitting shop. Forge shop. Machine shop. Heat treatments. Production control.

3.3. Technology: Longyear

3.4. Raw Materials: Steel, diamonds, etc.

4. IMPORTS

4.1. Items: Steel products, diamonds, etc.

4.3. Value: 1.4 to 1.5 MK/year.

5. INVOICING

6 to 7 MK/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Restriction of imports and decrease in demand because of the economic situation in the copper mining industry.

6.2. Plans: They plan to increase production when the economic situation of the mining companies improves.

7. CRITICAL JUDGMENT

A very well equipped shop with a high degree of technology, prepared to mass produce pieces. It has an excellent heat treatment facility. It could also produce other manufactures, always in large quantities; having previously obtained the licences from the mine equipment construction companies.

1. GENERAL DATA

1.1. Name of the Company: Atlas Copco

1.2. Location: Ndola

1.3. Name and position of the persons interviewed: Mr. Hayen, Managing Director.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Their principal activity is the sale of Atlas Copco machinery. They do repair and maintenance work.

3. RESOURCES

3.1. Installations and machinery: Small maintenance shop.

3.2. Personnel: 20 in Lusaka. 15 in Ndola, including sales personnel.

4. IMPORTS

4.1. Items: They import practically all their equipment.

4.2. Source: Sweden, U.K., U.S.A.

7. CRITICAL JUGDMENT

They are only sales agents and have no interest in manufacturing in Zambia.

TABLE 5.4.

PRODUCTION AND SUPPLY OF ELECTRICITY IN ZAMBIA

(Kwh million)

Year	Production in Zambia (1)	Supply to consumers in Zambia	Net balances
1,964	n.a	2,726.8	n.a
1,965		[illegible]	n.a
1,966	n.a	2,984.4	n.a
1,967	n.a	3,250.3	n.a
1,968	n.a	3,409.2	n.a
1,969	n.a	3,634.9	n.a
1,970	[illegible]	[illegible]	n.a
1,971	1,176.2	4,375.9	- 3,199.7
1,972	3,274.7	4,691.5	- 1,416.8
1,973	3,275.2	5,080.6	- 1,805.4
1,974	5,972.7	5,508.2	464.5
1,975 January-July	3,698.2	3,219.8	478.4

(1) Excluding works consumption

Source: Central Statistical Office, Lusaka.

1. GENERAL DATA

1.1. Name of the Company: SKF

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed:
Mr. S.T. Chireshe. Finance Manager.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Distribution and sale of SKF bearings. Construction of agricultural machinery. Construction of idlers for conveyor belts. Machining and repair of wheel assemblies.

2.2. Range of production: Idlers from 18" to 48". Agricultural machinery: trailers and plows.

2.3. Capacity: Manufacture of idlers: 7,000 units/month.
Machining of wheel assemblies: 80 units per month.

2.4. Utilisation of capacity: They work only one shift. They have a good work load.

3. RESOURCES

3.1. Installations and machinery: Machine shop. Fitting and assembly shop. Boiler shop.

3.2. Personnel: Total 101, of whom 52 are in the shops.

3.4. Raw Materials: Rollers, pipes, and accessories for idlers. Cast wheels. Wheels for trailers.

4. IMPORTS

4.1. Items; Bearings, steel pipe, idler accessories.

4.2. Source: Sweden, Italy, U.K., U.S.A., Germany, South Africa.

4.3. Value: At the present time, 120,000 K/year; three month ago, 450,000 to 600,000 K/Year.

5. INVOICING

900,000 K/year. Of this amount, 30-40% is for imported products.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Limitation of imports.

6.2. Plans: They plan to invest 50,000 K in machinery in 1976 to increase production and the range of idlers.

7. CRITICAL JUDGMENT

A medium sized factory with diversified and interesting production of mining equipment. It could be improved. The invoicing figure of 9,000 K/year/person is low.

At the present time, they have begun to manufacture idler rollers. Given the demand of the mining industry, they should manufacture a large share of the conveyors together with other firms that -- make assembled steel.

1. GENERAL DATA

1.1. Name of the Company: C. P. Engineering Company Ltd.

1.2. Location: Kitwe.

1.3. Name and position of the persons interviewed: Mr. Angelo Perucci, one of the Directors.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Construction of machined parts for the mining industry.

2.2. Range of production: All types of machined pieces within the limits of their machine tools.

3. RESOURCES

3.1. Installations and machinery: They have seven lathes, one turret lathe, two milling machines, drill, planer, sharpening machine.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Difficulty in finding specialized personnel.

7. CRITICAL JUDGMENT

A medium size machine shop that produces pieces of average precision. However, since they have no furnaces they are incapable of the necessary heat treatments. They have neither a technical office nor a laboratory. It would not appear to have possibilities for important expansion.

1. GENERAL DATA

1.1. Name of the Company: Congar

1.2. Location: Kitwe.

1.3. Name and position of the persons interviewed: Mr. Robert Campbell, Shop Manager.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Construction of machined parts for the mining, cement, sugar and textile industries.

2.2. Capacity: All kinds of machined parts, within the limits of their machine tools. They adjust motors. They make screws and bolts.

3. RESOURCES

3.1. Installations and machinery: Machine shop. 12 lathes, 4 millers, planer, boring machine, miscellaneous machinery.

3.2. Personnel: 50 Zambians, 4 expatriates.

4. IMPORTS

4.1. Items: Steel of different grades.

4.3. Value: 300,000 K/year.

5. INVOICING

600,000 K/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Import difficulties which could be largely solved by an adequate programming of parts orders from the departments of the mining companies.

6.2. **Plans**: They have a boiler shop planned.

7. CRITICAL JUDGMENT

A medium type shop, producing pieces of average precision. They have no technical office and therefore need the plans of the pieces. They have a heat treatment furnace. They have no laboratory.

1. GENERAL DATA

1.1. Name of the Company: Roan Engineering. Leco Limited

1.2. Location: Luanshya.

1.3 Name and position of the persons interviewed: Mr. Amin, Chairman of Roan. Mr. B. Liebenbery, Leco Limited.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

Metallic structures. Maintenance of compressed air machinery. Fiberglass.

2.2. Range of production:

Construction: Hydraulic and pneumatic actuating cylinders, pressure valves. Boilerware in general.

Repairs: Compressed air motors.

Fiberglass: Industrial and recreational construction.

2.3. Capacity: They are operating below their theoretical capacity.

3. RESOURCES

3.1. Installations and machinery: Machine shop. Boiler shop. Maintenance shop. Fiberglass facility.

3.2. Personnel: 420 Zambians and 32 expatriates.

3.3. Technology: Their own.

3.4. Raw Materials: Iron and steel products, components for making fiberglass.

4. IMPORTS

4.1. Items: Iron and steel products. Tools for the machines.

4.3. Value: 2.25 MK/year.

5. INVOICING

4.5 MK/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Difficulty of importation. High cost of raw materials. Difficulty in obtaining cast pieces in small runs. Lack of coordination with the purchasing departments of the mines.

6.2. Plans: They are enlarging the boiler shop.

CRITICAL JUDGMENT

This industry is made up of a group of three, consisting of - 452 people, forming a good basis for becoming in the future an important auxiliary to the mining industry.

At the present time, it has adequate machinery for the work it does and, with an improvement in machinery, an ample market could be opened to it.

1. GENERAL DATA

1.1. Name of the Company: Copperbelt Steel Manufacturing Co. Ltd.

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. O. Schenelker, Technical Manager.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1 Activities: Construction of yielding arches, medium and heavy boiler works, floor gratings, wire fences. Electric assemblies.

2.2. Range of production: Different manufactured products, within the activities mentioned above.

2.3. Capacity: Medium and heavy boiler works, 300 t/month. Yielding arches, 500-600 t/mont. Wire fence 150 t/month.

2.4. Utilisation of capacity: Satisfactory at present.

3. RESOURCES

3.1. Installations and machinery: Boiler shop with doublers and curvers for plate up to 11 mm, thick and 3 m wide.
Machine shop with lathes, planers, saw, and drill.
Shop for making yielding arches with special machinery.
Machinery for making wire goods.

3.2. Personnel: Total 225, of which 25 are expatriates. In the boiler shop, 128.

3.4. Raw Materials: Iron and steel products. Wire.

4. IMPORTS

4.1. Items: Beams of a special shape.

4.2. **Source**: The special beams from Germany. Iron and Steel products from various countries.

5. INVOICING

2,4 million K/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. **Problems**: Difficulty in importing and high cost of iron and steel products.

6.2. **Plans**: They are going to expand the plant and warehouse for electrical assemblies.

7. CRITICAL JUDGMENT

A medium plant that could increase its production to include other more complex types of construction for the mining industry.

They have demoustrated a capacity for development when they introduced into the market the manufacture of yielding arches for the mining industry.

Together with SKF they can manufacture pulleys and frames for conveyors. It is a company capable of developing its manufactures through new investments.

1. GENERAL DATA

1.2. Name of the Company: Refrigeration Fabricators.

1.3. Name and position of the persons interviewed: Kitwe.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Press shaping of fine plate.

2.2. Range of production: Electric panels, tubing for electric transformers. Electric conduits and shields, metal cabinets, steelworks.

2.4. Utilisation of capacity: High, since they have an important contract.

3. RESOURCES

3.1. Installations and machinery: Shapers, cutting machines, punching machines, welding machines. Paint shop.

3.2. Personnel: Total 70.

3.3. Technology: Their own, for normal production.

3.4. Raw Materials: Fine plate.

4. IMPORTS

4.1. Items: Steel plate. Dies and cutting tools.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: High price of plate, twice what it costs in South Africa.

6.2. Plans: At the present time, they have an important contract for making doors and shutters for buildings. Because of this they are going to expand their staff to 15 persons.

TABLE 5.5

ROUTE ANALYSIS OF EXTERNAL TRAFFIC (1)

(thousand metric tons, %)

By Road	1,970		1,971		1,972		1,973		1,974 (2)	
	TT	%	TT	%	TT	%	TT	%	TT	%
Tanzania Border	552	19.7	558	22.5	421	19.8	620	35.3	800	41
Through Tanzanian Ports	442	15.8	436	17.6	335	15.8	489	27.8	617	31.6
Other	110	3.9	122	4.9	86	4	131	7.5	183	9.4
Rhodesian Border	82	2.9	218	8.9	144	6.8	13	0.7	-	-
Through Mozambique Ports	32	1.1	68	2.8	39	1.8	6	0.3	-	-
Other	50	1.8	150	6.1	105	5	7	0.4	-	-
Malawi Border	26	1.7	38	1.5	46	2.2	189	10.8	143	7.3
Other Bordrs	6	0.2	5	0.2	3	0.1	30	1.7	13	0.7
Total By Road	666	23.8	819	33.1	614	28.9	852	48.5	956	49
By Rail										
Zaire Border	336	12	419	17	313	14.7	709	40.3	970	49.6
Through Lobito Bay	281	10	381	15.5	298	14	638	36.3	970	49.6
Other	55	2	38	1.5	15	0.7	71	4	n.a.	-
Rhodesian Border	1784	63.8	1219	49.3	1181	55.5	163	9.3	-	-
Through Mozambique Ports	1200	42.9	648	26.2	746	35.1	87	5	-	-
Other	584	20.9	571	23.1	435	20.4	76	4.3	-	-
Total By Rail	2120	75.8	1638	66.3	1494	70.2	872	49.6	970	49.6
By Air	8	0.3	9	0 4	13	0.6	30	1.7	27	1.4
Other	3	0.1	5	0.2	7	0.3	4	0.2	n.a.	-
Grand Total	2797	100	2471	100	2128	100	1758	100	1953	100

(1) Goods cleared during the calendar year, excluding petroleum pipeline

(2) Provisional

Source: Annual Statement of External Trade and own elaboration

7. CRITICAL JUDGMENT

It is a shop with modern machinery. However, generally speaking, except for electrical panels and transformer tanks, it is of little use in the mining industry.

1. GENERAL DATA

1.1. Name of the Company: Lenco.

1.2. Location: Lusaka.

1.3. Name and position of the persons interviewed: Mr. Ugwumba, Marketing Manager. Mr. Gazina, Manufacturing Manager.

1.4. Other data: The company belongs 60% to Indeco; the remainder is owned by two Italian companies.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Sheetmetal work, steelwork, office furniture, nails, safes, wallsafes

2.2. Sheetmetal work: Water bowser, bulk cement delivery vehicles, farm trailers, bus bodies, etc.

Steelwork: frames, windows.

Metal furniture: Shelving, office tables, clothes, lockers, cabinets, filing drawers.

Nails: Metric sizes 2.5 mm to 152.4 mm.

2.4. Utilisation of capacity: They work only one shift five days a week.

3. RESOURCES

3.1 Installations and machinery: Steelwork shop. Light boiler shop. Nail making shop.

3.2. Personnel: 618 workers, of whom 30 are expatriates.

3.3. Technology: Italian.

3.4. Raw Materials: Iron and steel products.

4. **IMPORTS**

4.1. **Items**: Iron and steel products.

4.3. **Value**: 2.5 MK/year.

5. **INVOICING**

8 KM/year.

6. **PRESENT PROBLEMS AND FUTURE PLANS**

6.1. **Problems**: Low demand and high cost of iron and steel products.

7. **CRITICAL JUDGMENT**

An industry with adequate personnel and machinery, but making only products of little use to the copper industry. They only have one draughtsman in the technical office.

1. GENERAL DATA

1.1. Name of the Company: B.M.S.

1.2. Location: Lusaka

1.3. Name and position of the persons interviewed: Mr. Mack Jr.

7. CRITICAL JUDGMENT

This is a plant that makes the same articles as Lemco but with fewer means and personnel (90 total). A plant of little use for copper mining.

1. GENERAL DATA

1.1. Name of the Company: African Wire Ropes

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. G.H. Nelson. General Manager Director.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Manufacture of steel cable. Sale of imported cable.

2.2. Range of production: Excavator cables, cranes, include haulage systems, lifts, and elevators.

2.3. Capacity: 600 t/year of cable.

2.4. Utilisation of capacity: 50% of nominal.

3. RESOURCES

3.1. Installations and machinery: Diverse lines for braiding wire and cables.

3.2. Personnel: 98, 2 expatriates.

3.3. Technology: Maggic Rad R.S.A.

3.4. Raw Materials: High carbon steel wire.

4. IMPORTS

4.1. Items: High carbon steel wire

4.2. Source: Belgium, U.K. West Germany.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Lessening of demand, which at the present time is only 300 t/year. Difficulty in getting raw materials because of transport problems from the receiving ports in Zambia.

6.2. Plans: They will try to augment the range of production in order to reduce even more the quantity of imported cable.

7. CRITICAL JUDGMENT

A well structured industry, with good technology and more than enough capacity to supply Zambia and to export.

1. GENERAL DATA

1.1. Name of the Company: A. W. Construction

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: Mr. C. Ac. Hobbs, Sales Manager.

2. ACTIVITIES PRODUCTS AND PRODUCTION

2.1. Activities: Sale of imported chains for hoists. Manufacture of 3/8" chains. Manufacture of slings. Sale of imported hoists. Repair of hoists.

2.2. Range of production: 3/8" chain made from steel rods.

2.3. Capacity: 500 kg per day of 3/8" chain.

2.4. Utilisation of capacity: They are operating far below their nominal capacity because of the lack of market.

3. RESOURCES

3.1. Installations and machinery: Cutting, bending, and 3/8" rod welding machine for making chain. Test bench.

3.2. Personnel: 32 workers.

3.3. Technology: Columbus Machine Incorporated

3.4. Raw Materials: Steel rods.

4. IMPORTS

4.1. Items: Chains and hoists.

4.2. Source: South Africa and U.S.A.

4.3. Value: At present, 42,000 k/year. In normal conditions, 210,000 K/year.

5. INVOICING

The value of production represents 25% of sales total.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Lack of market and restriction of imports.

6.2. Plans: Possible increases in the range of manufactured chains if the country's economic situation improves.

7. CRITICAL JUDGMENT

A very small shop of scant importance in supplying the mining industry.

1. GENERAL DATA

1.1. Name of the Company: CULLINAN

1.2. Location: Kitwe

1.3. Name and position of the persons interviewed: They did not wish to provide these data.

2. ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities: Production of cement.

2.2. Range of production: Chromium-magnesite.

2.4. Utilisation of capacity: They work one shift, five days a week.

3. RESOURCES

3.1. Installations and machinery: Grinding and grading installation.

3.4. Raw Materials: Chrome ore, magnesite, bentonite, sodium, silicate, soda ash etc.

4. IMPORTS

4.1. Items: All materials except silica and chamotte.

4.3. Value: At the present time, 30,000 K/year. Under normal circumstances, 240,000 K/year.

6. PRESENT PROBLEMS AND FUTURE PLANS

6.1. Problems: Limits on import of raw materials.

6.2. Plans: None.

7. CRITICAL JUDGMENT

It is a small factory with simple grinding and mining facilities.

It makes refractory cements and bulk refractories for the mining industry and others, starting from imported raw materials.

It could extend its commercial activity and avoid imports of these products if the quality of their wock is adequate.

They are not at all prepared to make refractory bricks.

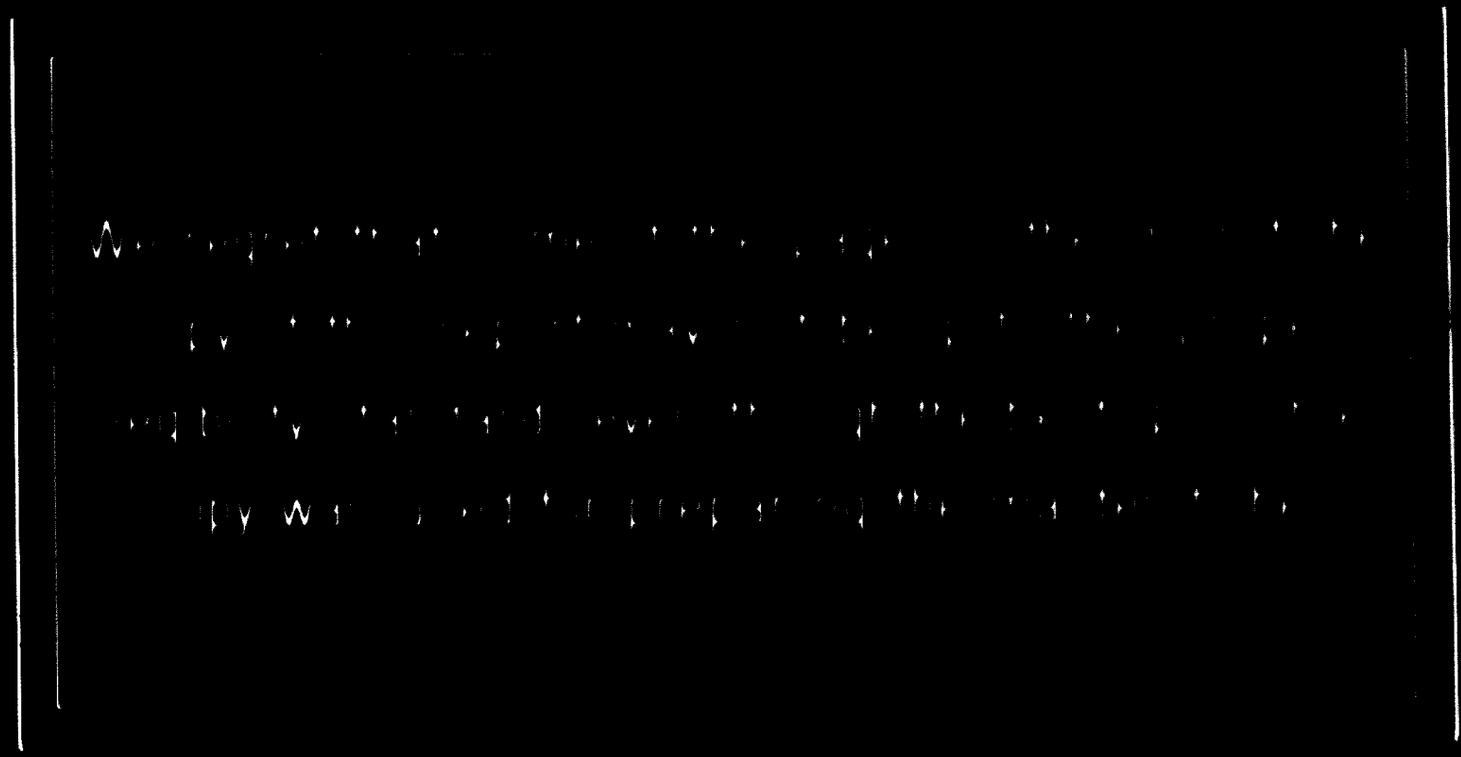

TABLE 5. 6.

ROUTE ANALYSIS OF IMPORTS (1)

(thousand metric tons, %)

	1,970		1,971		1,972		1,973		1,974 (2)	
By Road	TT	%	TT	%	TT	%	TT	%	TT	%
Tanzania Border	[illegible]	1[illegible]	13[illegible]	[illegible]	[illegible]	[illegible]	25[illegible]	[illegible]	[illegible]	38.1
Through Tanzania Ports	[illegible]	8.8	215	12.[illegible]	[illegible]	[illegible]	178	[illegible]	[illegible]	29.[illegible]
Other	109	5.9	121	7.2	85	6.[illegible]	103	[illegible]	[illegible]	9.1
Rhodesian Border	78	4.2	217	12.8	143	11.3	12	1.2		
Through Mozambique Ports	29	1.6	67	4	39	3.1	6	0.6		
Other	49	2.6	150	8.8	104	8.2	6	0.6		-
Malawi Border	20	1.1	29	1.7	39	3.1	166	17.8	136	13.4
Other Borders	2	0.1	2	0.1	1	0.1	18	1.9	13	1.3
Total By Road	373	20.1	585	34.5	394	31.1	477	51	536	52.8
By Rail										
Zaire Border	130	7	269	15.8	144	11.3	305	32.7	453	44.6
Through Lobito Bay	123	6.6	257	15.1	136	10.7	298	31.9	453	44.6
Other	7	0.4	12	0.7	8	0.6	7	0.8	n.a	-
Rhodesian Border	1348	72.5	831	49	713	56.1	120	12.9	-	-
Through Mozambique Ports	811	43.6	299	17.6	324	25.5	53	5.7		
Other	537	28.9	532	31.4	389	30.6	67	7.2		
Total By Rail	1478	79.5	1100	64.8	857	67.4	425	45.6	453	44.6
By Air	4	0.2	7	0.4	11	0.9	28	3	27	2.6
Other	3	0.2	5	0.3	7	0.6	4	0.4	n.a	
Grand Total	1858	100	1697	100	1269	100	934	100	1016	100

(1) Goods cleared during the calendar year, excluding petroleum pipeline

(2) Provisional

Source: Annual Statement of External Trade and own elaboration

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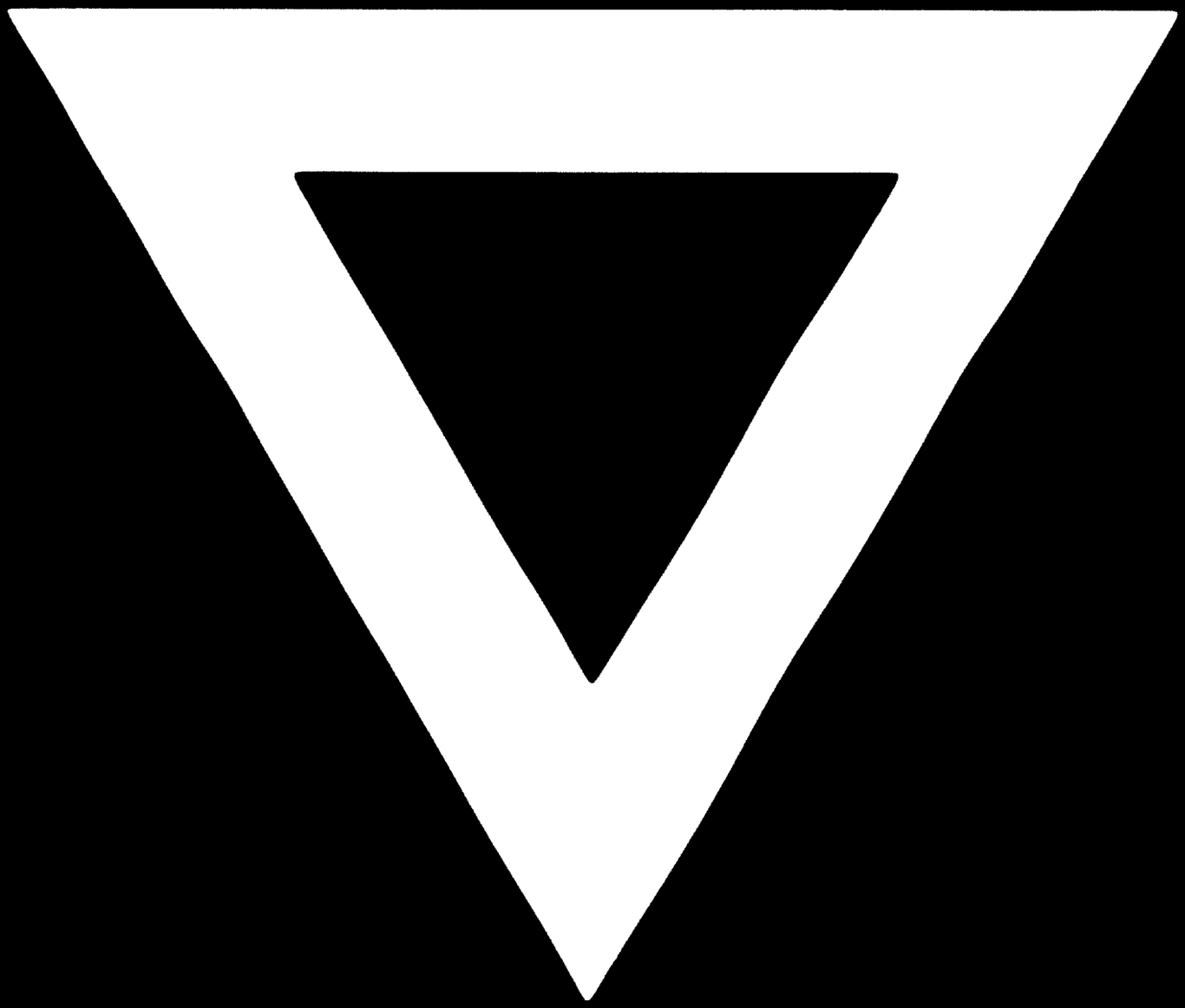

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TABLE 5.7.

ROUTE ANALYSIS OF EXPORTS (1)

(thousand metric tons, %)

By Road	1,970		1,971		1,972		1,973		1,974 (2)	
	TT	%	TT	%	TT	%	TT	%	TT	%
Tanzania Border	279	29.7	221	28.5	210	24.5	339	41.1	413	44.1
Through Tanzanian Ports	278	29.6	220	28.4	209	24.4	311	37.7	322	34.4
Other	1	0.1	1	0.1	1	0.1	28	3.4	91	9.7
Rhodesian Border	4	0.4	1	0.1	1	0.1	1	0.1	-	-
Through Mozambique Ports	3	0.3	1	0.1	-	-	-	-	-	-
Other	1	0.1	-		1	0.1	1	0.1	-	-
Malawi Border	6	0.7	9	1.2	7	0.8	23	2.8	7	0.7
Other Borders	4	0.4	3	0.4	2	0.2	12	1.5	-	-
Total By Road	293	31.2	234	30.2	220	25.6	375	45.5	420	44.8
By Rail										
Zaire Border	206	21.9	150	19.4	169	19.7	404	49.1	517	55.2
Through Lobito Bay	158	16.8	124	16	162	18.9	340	41.3	517	55.2
Other	48	5.1	26	3.4	7	0.8	64	7.8	n.a	
Rhodesian Border	436	46.5	380	50.1	468	54.5	43	5.2	-	
Through Mozambique Ports	389	41.5	349	45.1	422	49.1	34	4.1	-	
Other	47	5	39	5	46	5.4	9	1.1	-	
Total By Rail	642	68.4	538	69.5	637	74.2	447	54.3	517	55.2
By Air	4	0.4	2	0.3	2	0.2	2	0.2	n.a	-
Other	-	-	-	-	-	-	-	-	-	-
Grand Total	939	100	774	100	859	100	824	100	937	100

(1) Goods cleared during the calendar year, excluding petroleum pipeline.
(2) Provisional
Source Annual Statement of External Trade and own elaboration.

TABLE 5.8.

MOTOR VEHICLES FLEET (31 DECEMBER)

Year	Automobiles	Buses	Vanettes	Trucks	Tractors	Trailers	Construction vehicles	Motorcycles	Total
				PRIVATE					
1,969	53,849	658	15,467	10,179	2,564	4,246	190	5,960	93,113
1,970	58,508	668	16,253	10,740	2,759	4,330	220	6,331	99,809
1,971	61,579	690	18,118	11,666	3,393	4,969	258	6,939	107,612
1,972	65,794	769	20,705	12,725	3,910	5,310	382	8,233	117,828
1,973	72,140	780	23,502	13,375	4,469	5,519	472	8,446	128,703
				GOVERNMENT-OWNED (1)					
1,969	6,046	-	-	-	1,217	375	396	430	8,464
1,970	7,031	-	-	-	1,294	477	425	505	9,732
1,971	8,178	-	-	-	1,411	529	455	650	11,223
1,972	8,932	-	-	-	1,471	556	637	656	12,252
1,973	9,012	-	-	-	1,517	556	657	668	12,410
				TOTAL (1)					
1,969	59,895	658	15,467	10,179	3,781	4,621	586	6,390	101,577
1,970	65,539	668	16,253	10,740	4,053	4,807	645	6,836	109,541
1,971	69,757	690	18,118	11,666	4,804	5,498	713	7,589	118,835
1.972	74,726	769	20,705	12,725	5,381	5,866	1,019	8,889	130,080
1,973	81,152	780	23,502	13,375	5,986	6,075	1,129	9,114	141,113

(1) Excluding defense forces equipment

Source: Central Statistical Office, Lusaka.