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MUCANHA-VUZI COAL DEVELOPMENT PROGRAM

PHASE II

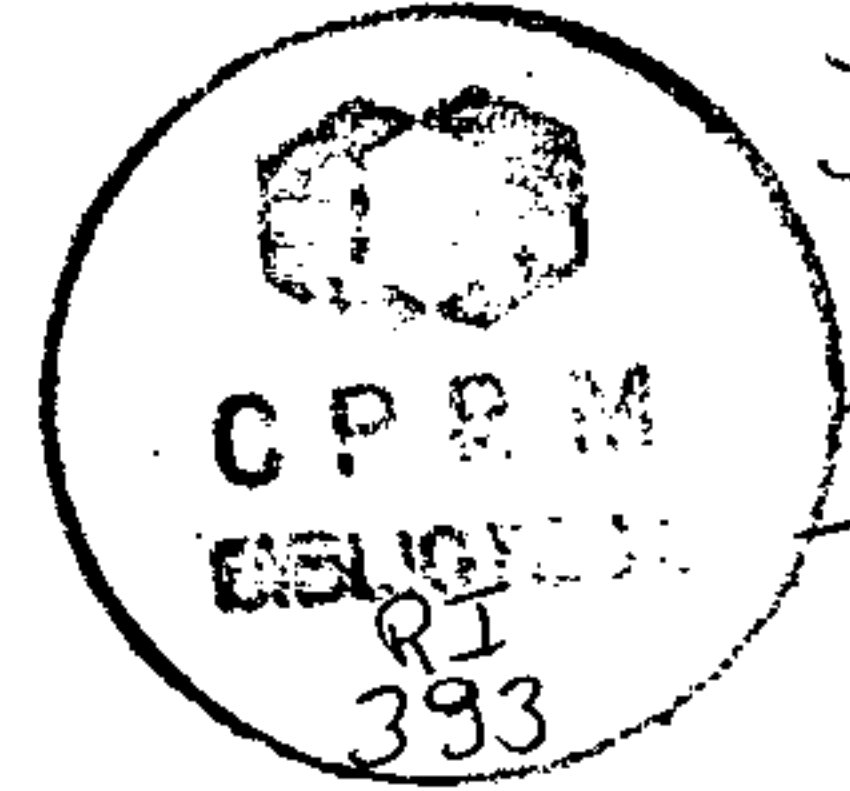
TECHNICAL AND COMMERCIAL PROPOSAL

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FOREWORD

The People's Republic of Mozambique presents, for the consideration of the OPEC Fund for International Development, the technical and commercial proposal which follows up the exploration and development programme for the coal deposits at Mucanha-Vuzi, in the Province of Tete. The proposed second phase of the Mucanha-Vuzi Programme is an integral and vital part of the project which aims at increasing the production and transportation capacity of coal in Mozambique, in cooperation with other countries, particularly with the Federative Republic of Brazil.

As it is known, the project for the development and full utilization of the immense coal reserves in Mozambique should create one of the country's main economic and social development centres, and as such, is a project of national priority.

To illustrate these observations, the continuation of the project will give rise to increasing cooperation between developing countries, using their own materials and human resources. In the particular case of bilateral cooperation with Brazil, this project will initiate important commercial exchanges and an increased potential for cooperation between the two countries.

The special effort of the Brazilian consultants agencies involved in Phase I of the Mucanha-Vuzi Project resulted in their work being speeded up, so, enable the conclusion of the final report and presentation of results two months ahead the schedule. Based on the conclusive results and recommendations of the Phase I, this proposal was conceived. It also represent an enhanced and definitive version of a preliminary draft proposal presented to the OPEC Fund in October/1982.

It presents an outline of the technical and investment programme to enable the OPEC Fund to evaluate its interest in continuing to participate in the Coal Project for Mozambique.

This document is divided into two parts: the first, containing the technical proposal, and the second, containing the commercial proposal and the financial bases of the programme.

A - TECHNICAL PROPOSAL

A.1 - Antecedents and Objectives

The technical proposal here presented is based on the conclusive results and recommendations expressed in the Final Report of the Mucanha-Vuzi Coal Development Program Phase I. This program was object of a services contract signed on 01.12.1982 between the Cabinet of State Secretariat for Coal and Hydrocarbons - GSECHI of the People's Republic of Mozambique and Companhia de Pesquisa de Recursos Minerais - CPRM, a Brazilian government-owned company.

The large quantity and quality of data and information gathered on all of the multi-disciplinary aspects involved in the project, provided a clear and sound basis for the proposed follow-up study. Above all it should be emphasized the huge volume found of metallurgical grade coal reserves, suitable to open-pit mining. In fact, the measured and indicated coal reserves guarantee the basic conditions required for the installation of an important mining complex which would ensure a volume of production necessary to make viable the cost of mining, preparation and a competitive transport system.

The objectives of the technical proposal under discussion are:

1. A detailed geological report on the deposits up to the stage of setting up the mining project.
2. Basic Mine Project, Preparation Installations and Auxiliary Works.
3. Basic Transport System Project for the Outflow of Production of the Mucanha-Vuzi Region coal.
4. Definition of the Technical, Economic and Financial Feasibility of the Enterprise.

5. Studies of Alternatives for Integrated Regional Development and Land Occupation-Middle Zambeze.

The basic projects mentioned will be detailed to a standard suitable for tenders.

A.2 - AREA AND GEOGRAPHICAL LOCALIZATION

The coal-field area of Mucanha-Vuzi, which constitutes the potentially most important part of the extensive Chiccoa-Mecucoê coal basin, situated in the Province of Tete along the Zambeze River, on the high side of the Cahora-Bassa dam, is almost all located in the district of Magoé and in a small part of the district of Moravia, bordering the north shore of the Cahora-Bassa Lake. It occupies an area of a little more than 300 km² (40 km in length by an average width of about 8 km), although about 40% of this area is permanently submerged under the above mentioned lake. In extreme cases of the rise of the level of the waters (catastrophic flood), a little over 50% of the area might be submerged.

The Mucanha-Vuzi programme, already executed by CPRM, is located on the central-north part of the Chiccoa-Mecucoê Basin, between the 31° 15' W and 31° 28' W meridians, a zone dominated by the Rivers Bohozi and Vuzi. The second phase of the Mucanha-Vuzi Programme with which the presented proposal is concerned, will be developed in the western part of that area, that is, in the coal field of the Bohozi River, which extends to the east up to the region dominated by the Mucanha River.

A.3 - SCOPE AND METHODOLOGY OF THE UNDERTAKING

The projects to be undertaken are organized around three programs:

- 1 - Geological Exploration Programme
- 2 - Basic Transport System Project
- 3 - Basic Project for the Mine and a Study of the Economic, Financial and Social Viability.

Each programme is in its turn composed of a certain number of activities, detailed in Chart I, and discussed in detail on the following pages.

A.3.1 - GEOLOGICAL EXPLORATION PROGRAM

A.3.1 - Geological Exploration Program

The first phase of the Mucanha-Vuzi coal geological exploration program, now concluded, pointed out to the occurrence of large reserves of metallurgical grade coal, in quantities well above 1.5 billion tons, as is shown in detail on the chapter 3 of this report.

The geological information gathered during the above mentioned program permits to confirm, confidently, the extension to the east, as far as the Mucanha river, of the same coal seams studied in the Bohozi Block. On account of this, a total extension of about 26 km along the strike, can be estimated for the outcropping coal-bearing sequence in the Bohozi-Mucanha coal field.

Within this context, the part studied, up to now, by CPRM correspond to about 12 km in length, that is almost half of the total coal field extension.

The geological exploration program, also extended to a hydrogeological survey, now proposed, was conceived based on the conclusions and recommendations expressed on the items 3.4 and 3.5 and also 7.5 of this report. The main objectives of the proposed plan are:

- . Detailed exploration of the B₁, B₂ and B₃ coal seams in the Bohozi Block, up to the level required by the planning and implementation of the mining project.

- . Detailed hydrogeological survey on the Bohozi Block area aimed at quantitative studies on the shallow aquifers and at studies on water infiltration from the Cahora Bassa reservoir into the coal-bearing sequence.

The proposed exploration program contains seven general activities, described in detail as follows:

A.3.1.a - Surface and Sub-surface Geological and Hydrogeological Services

The total selected area of the Bohozi Block for detailed studies comprises about 96 km², out of which about 50 km² correspond to the area of direct interest of the B₁, B₂ and B₃ coal seams. The

selected area is represented on the Annex I, and is limited by the UTM coordinates: 8,270,000 mN to 8,278,000 mN; 328,000 mE to 340,000 mE.

About 50 km² will be geologically mapped on the scale 1:1,000, with accurate topographic support for the location of outcrops, coal outcrop lines, fault zones and any other geological features considered to be relevant. In the same way, the top and bottom layers enclosing the coal seams will be mapped out in the detail required by the scale and their mechanical properties assessed.

The sub-surface exploration will be based on a square drilling grid of 250 m x 250 m, designed to study the B₁, B₂ and B₃ coal seams in the areas of less than 80 meters of overburden thickness, schematically represented on the map of Annex I.

The sub-surface geological work will also include the integration of all the information produced by the drilling campaign together with the surface geological data, in order to obtain detailed knowledge of the geometry of the deposit in three dimensions, by means of sections and tri-dimensional models.

Estimate of the coal reserves will take into account the measured, indicated and inferred reserves of each of the individual blocks of the deposit, which together will make up the total amount of reserves. Statistical methods and, if considered necessary or suitable, geo-statistical methods, will be used to estimate the reserves and also for the study of the distribution behavior of some variables.

The information produced from the physical-chemical and technological studies will be presented in distribution maps for some parameters considered important for planning the mining operation, such as the sulfur content, washing yield for specific ash content etc.

The detailed geological services will further produce isopachmaps for all the coal seams of economic importance and isopachmaps of the overburden, made out on a scale of 1:1,000, for the whole studied area of the deposit.

The hydrogeological studies will be directed to the following objectives:

- a) Investigations of the Bohozi Block free aquifer in order to define its probable influence on future open pit mining operations. Quantitative studies will define the volumes of ground water infiltration to be expected, and the other parameters necessary to the planning of the open pit drainage systems projects.
- b) Detailed studies on the hydrogeological conditions on the bordering area of the Cahora Bassa lake, to investigate the level and extension of eventual infiltrations of the lake waters towards the future mining areas.

A piezometer observation net will be set up on the Bohozi area, using as observation points, selected coal exploration DDH, as well as, specially designed hydrogeological wells. For quantitative evaluations of the free aquifer, pump-test wells will be drilled and constructed according to the basic design of figure 01. Special piezometers wells will be drilled in sections perpendicular to the lake margins to investigate the hydraulic gradient towards the coal-bearing sequences.

All the hydrogeological data will be presented in maps, sections, etc, at adequate scales to the detailed level of the investigations.

A.3.1.b - Drilling Campaign

To draw up the proposed plan, consideration was given, first of all, to the information generated by the drilling campaign and geological mapping of Phase I of the Mucanha-Vuzi Programme, and secondly to the degree of detail of the characteristics of the deposit, necessary for the definition and setting-up of the mining project.

For the Bohozi Block area a square drilling grid (250 m x 250 m) will be set on the areas of less than 80 meters of overburden, for exploration of the B₁, B₂ and B₃ coal seams. As can be seen in Annex I, and on the table A, about 242 DDH with an average depth of 85 meters will be drilled, which sum up to 20,570 meters of total drilled length.

For the hydrogeological studies, about 1,430 meters of total drilled length will be necessary, distributed as follows: four pump-test wells of about 90 meters depth, each, according to the basic design of figure 01; about 14 observations wells in sections perpendicular to the lake margins, with an average depth of 75 meters.

Beside the special purpose hydrogeological wells, a piezometer observation net will be set, as commented before.

For the whole program, a total of 22,000 meters of drilling have been planned, to be distributed among about 260 boreholes. For the actual location of each drillhole, the existing DDH will be taken into consideration, and a careful analysis of the geological data will be made, in order to find the most effective use for the proposed drilling length.

The drilling operation must follow the undermentioned procedure:

1. Topographic location and levelling of all DDH collars. This job will be done by the topographic field team (see A.3.1.e), under request of the exploration geologists.

2. Except for the hydrogeological pump-test wells, all DDH will be drilled using wire-line diamond drilling machines and, under any circumstances, should keep the following minimum diameter distribution:
 - . At least 18,000 meters out of a total of 20,570 meters of coal exploration DDH, should be drilled on minimum "NQ" size diameter (4.76cm). From this total about 20% or 3,600 m should be drilled on "HQ" size (6.35cm) in holes specially designed for coal bulk sampling.
 - . About 12% or 2,570 m of the coal exploration proposed drilling length, could be drilled on minimum "BQ" size diameter (3.65 cm), in cases of explicit technical difficulties.
3. The hydrogeological pump-test wells will be drilled using a conventional rotary drilling rig, operating a tricone type drilling bit, 10" diameter. The pump-test wells will be constructed and completed on 6 5/8" casing tubes diameter.
 - . The hydrogeological special purpose piezometers wells will be drilled "NQ" size diameter (4.76 cm) which is suitable for piezometer construction, according to the basic design of Fig. 1.
4. Except for the pump-test wells, all holes will be continuously cored. A minimum core recovery of 90% should be achieved for all coal seam intersections. The sedimentary barren rock intersections could have inferior recovery rates or can even be destroyed, depending upon the drilling operation technical convenience.
5. The drill cores will be encased in wooden boxes with a rigid bottom and sent to the drill core description and sampling section at the CPRM camp site.
6. After the conclusion of the drilling and geophysical profiling operations, the coal exploration drill

holes will be prepared as piezometers observation wells or will be sealed off with a cement cap bearing a metal plate with the DDH number and information about its UTM coordinates, elevation, final depth etc.

TABLE A

DRILLING PLAN - BOHOZI BLOCK

COAL SEAM	NUMBER OF DDH	DRILLED LENGTH (m)	AVERAGE DDH DEPTH (m)
B ₁ (Sup + Inf)	110	9,350	85
B ₁ and B ₂	6	720	120
B ₂	70	5,600	80
B ₂ and B ₃	14	1,540	110
B ₃	42	3,360	80
TOTAL	242	20,570	85

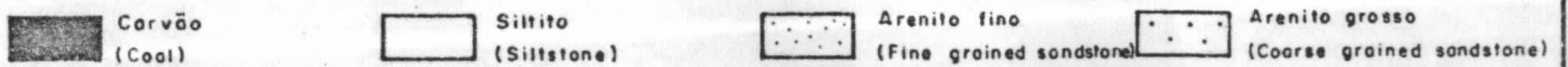
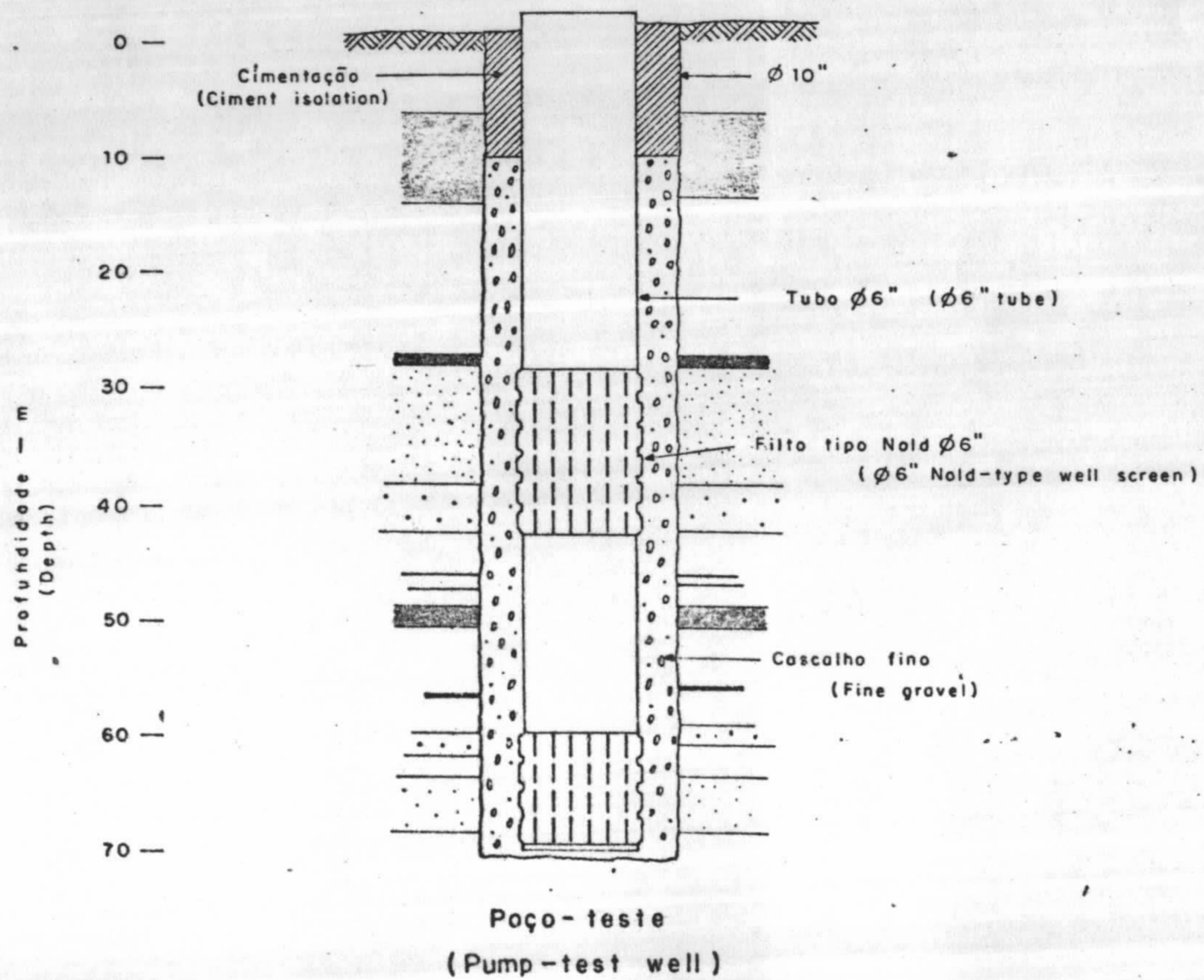
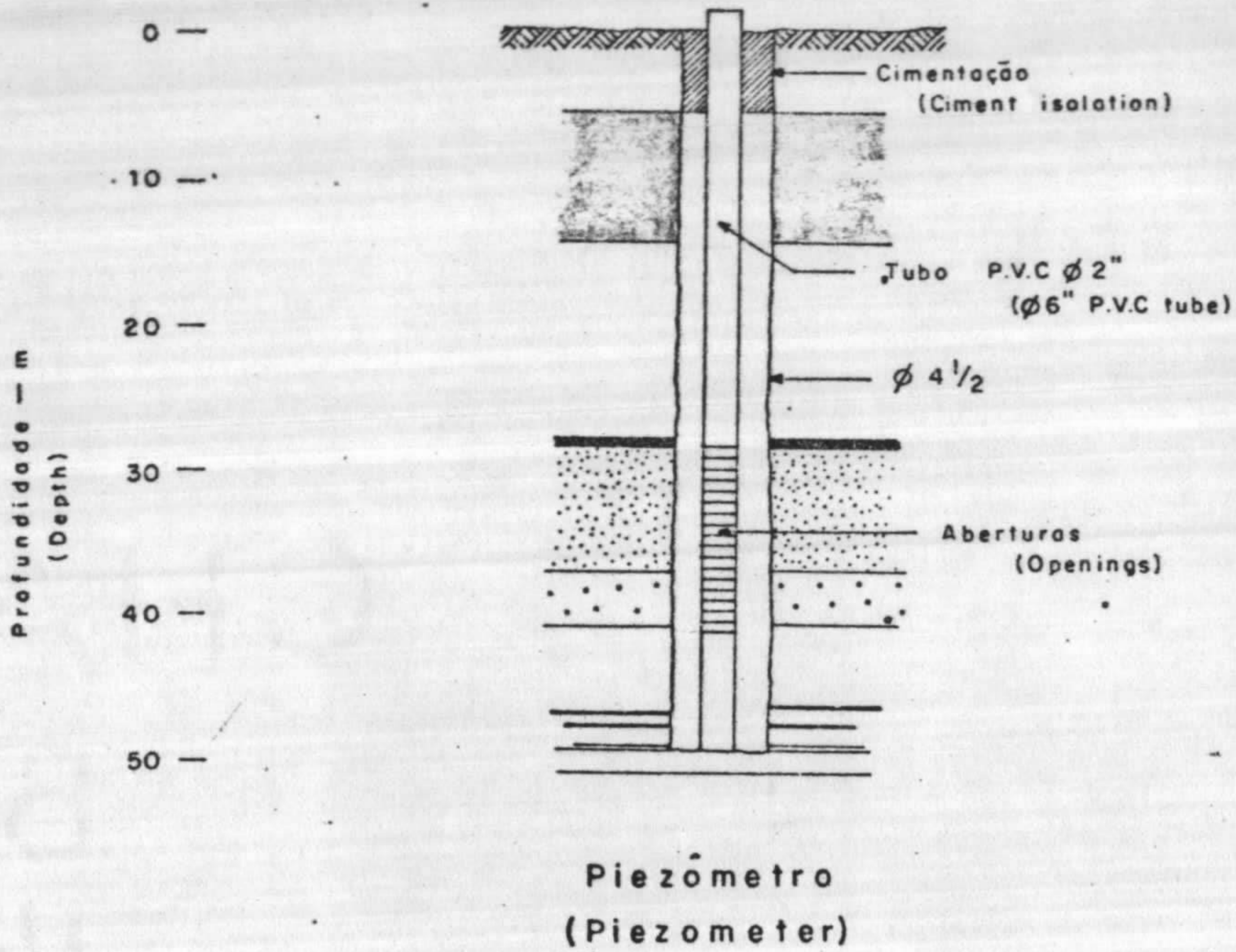


FIG. 12 PROJETOS BÁSICOS DE PIEZÔMETRO E POÇO-TESTE
(BASIC DESIGN OF PIEZOMETER AND PUMP-TEST WELL)

A.3.1.c - Geophysical Profiling (logging)

After the conclusion of each drillhole a standard set of geophysical logs will be run. It is proposed the same type of logs used in the first phase of the program, i.e., gamma-rays, spontaneous potential and resistance, and additionally the density, caliper and sonic logs, which are particularly recommended for detailed coal exploration programs.

The combined geophysical log display of gamma-ray, resistance, s.p., density, caliper and sonic logs, would considerably increase the geological detail of the Mucanha-Vuzi coal deposit, also allowing to obtain a better interpretation of the structural configuration of the coal seam.

All profiles will be run on the 1:500 and 1:100 scales, in all the DDHs, which have previously been conditioned with adequate drill mud for optimizing the responses of the electric profiles.

About 20,000 metres of DDHs will be profiled which corresponds approximately to the total of uncased drill holes. Because of the rate of progress expected for the drilling campaign, two geophysical profiling teams will be employed.

Two sets of logging equipment will be used, consisting of a Mount Sopris 3000 logging unit equipped with a gamma-resistance s.p. module; a sonic module and a gamma-gamma (density) - caliper module, and respective probes.

A.3.1.d - Chemical and Technological Analysis and Tests

A wide program of analyses and tests will be undertaken on the coal samples, both drill core and bulk samples, aimed at investigating thoroughly the relevant physical-chemical properties of the Mucanha-Vuzi coal for the two main end uses: as coking and as energetic coal. The proposed analytical program is summarized on the table below.

ANALYSIS/TEST.	COAL END USE POTENTIAL	
	COKING	ENERGETIC
Sink and Float	X	X
Proximate Analysis	X	X
Ultimate Analysis	X	-
Sulphur	X	X
Gross Calorific Value	-	X
Specific Gravity	X	X
Ash analysis - major elements	X	X
- minor elements	-	X
Ash fusion properties	-	X
Hardgrove Grindability Index (HGI)	X	X
Free Swelling Index (FSI)	X	X
Audibert Arnu dilatometry	X	-
Gieseler plastometry	X	-
Maceral Analysis	X	-
Vitrinite Refletance	X	-
Coke oven	X	-

Sink and float tests will be performed on all coal samples. The analytical routine will be the same adopted for the first phase of the program, i.e., in the granulometric range 1/8" x 200 mesh, using the same heavy liquid densities: 1.35, 1.50, 1.65, ~~1.80~~, 1.85, 2.10. About 1670 coal core samples will

be prepared by this method.

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- . Proximate analysis (Moisture, Ash, Volatile Matter and Fixed Carbon), will be performed on the three lighter fractions, i.e., on -1.35; 1.35 - 1.50 and 1.50 - 1.65 fractions. Therefore a total of about 5.010 coal fractions samples plus 1670 coal head samples is planned to be analysed.
- . Ultimate analysis (C,H,O,N) in at least 10 samples for each coal seam, totalling about 40 samples will be undertaken.
- . Sulphur-elementar sulphur determination will be performed in the same samples analysed in the proximate analysis, or in about 6.680 samples.
- . Gross calorific value and Specific Gravity will be determined in all fraction floated on 1.65 and on all head samples. About 3.340 samples shall be analysed.
- . Ash analysis - major and minor elements in the ashes of the fraction floated on 1.65 will be performed on about 20% of the samples, i.e. about 334 samples.
- . Ash fusion properties. Ash fusibility tests will be performed in about 20% of the samples floated on 1.65, totalling about 334 determinations.
- . Hardgrove Grindability Index- HGI tests will be performed in the same number of samples mentioned in the last item, i.e. 334 samples.
- . Free Swelling Index (F.S.I.) on the same samples used for the Proximate analysis, F.S.I. determinations will also be performed, totalling about 6680 determinations.
- . Audibert Arnu dilatometry and Gieseler Plastometry will be performed in the 3 lighter fractions, i.e. about 500 sample fractions.
- . Maceral Analysis and Vitrinite Reflectance. For each coal seam two complete and typical sections will be

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- sampled for micropetrographic studies, maceral microlithotypes and reflectance.
- Oven coking tests are proposed for all light fraction obtained from the channel samples or all main coal seams.
- Geomechanical tests of density, porosity, uniaxial and diametral compressive strength tests will be performed in all lithologies found as the main coal seams overburden, up to 40 meters thick. A complete series of tests for each mining section, totalling about 50 determinations for each test, is planned.
- For each main coal seam two bulk channel sample weighing between 600 kg will be crushed in different maximum sizes (3", 1 1/2", 1/2" and 1/8"), for sink and float tests at density interval of 0.05, from 1.30 to 1.90 and 0.10 to 2.10. The coal fines will also be tested on flotation and hydrocyclones.

A.3.1.e - Detailed Topographic Survey

The detailed topographic survey of an area of 50 Km² is proposed, which will cover all the selected area of the coal field.

The planned services will produce topographic maps on scale of 1:1,000, with equidistance levelling (contour lines) of one meter.

The maps will be obtained by ground topographic survey, executed by three teams of two surveyors each, at the precision level required by the map scale.

The work of locating and levelling the drilling network, drill collar position and elevations, the coal seams outcropping lines, and any other relevant geological features, as well as all the auxiliary topographic services necessary for the surface geological teams, are included in this item.

All the topographic work to be undertaken, will be conducted based on the points with known planialtimetric coordinates, which have already been transferred and fixed in the area during the first phase of the project.

Wherever necessary, new bench marks will be built with an identification plate on the top of each one containing the planialtimetric coordinates.

The final art-work will consist of a cartographic drawing on a stable plastic film base from which transparencies or ordinary heliographic copies (blue prints) can be made.

A.3.1.f - Data Compilation, Sampling and Data Processing

Under this activity the following tasks will be undertaken:

1. Drill cores description, through the visual analysis and detailed lithological description of the drill cores of each hole. The cores will be described and logged at the 1:500 and 1:100 scales. The coal seams will be cut length-wise and logged at scale 1:20 according to the Schopf's(USGS) method. A visual evaluation of the vitrain content, in percent, in each coal band will be made and logged.

2. Interpretation and adjustment of the lithological logs to the geophysical logs and correlation between the litho/logs and the different geophysical profiles. From this work a compound litho-geophysical log for each drill hole will be produced and drafted on a transparent base, to be kept as technical documentation of the project.

3. Sampling of the coal seams.

A comprehensive sampling program of the coal seams will be undertaken as follows:

a) Drill cores coal seams sampling. All the main coal seams, i.e., B₁, B₂ and B₃, cored in each DDH will be sampled in detail. Considering as means thickness, 30 m, 8 m and 10 m for the B₁, B₂ and B₃ coal seams, respectively, and taking into account the proposed drilling plan (Table A) the expected accumulated length of the cored coal seams can be calculated as follows:

	B ₁	- 110/DDH - 30 m coal seam p/DDH	3,300 m
B ₁ and	B ₂	- 6/DDH - 38 m coal seam p/DDH	228 m
	B ₂	- 70/DDH - 8 m coal seam p/DDH	560 m
B ₂ and	B ₃	- 14/DDH - 18 m coal seam p/DDH	252 m
	B ₃	- 42/DDH - 10 m coal seam p/DDH	<u>420 m</u>
		Sub-total	4,760 m

±5% Allowance for minor coal seams intersections	240 m
Total accumulated thickness of cored coal seams	5,000 m

Now, considering 2 meters as the mean coal core sample length, a total of about 2,500 samples should be produced if all coal exploration DDH were sampled. However, as a comprehensive multivariant display of geophysical logs will be run in all DDH and taking into account the narrowness of the drilling grid, it is not necessary to sample and analyse all DDH. In fact the use of the density (gamma-gamma), sonic and caliper logs will produce information about the coal quality good enough to spare a large number of costly physical-chemical analyses.

According to this assumption it is proposed to leave one DDH out of three, without sampling, i.e., and about 2/3 of all DDH will be sampled for analytical purpose. Therefore about 1,670 coal core samples ($2,500 \times 2/3$) will be produced.

The sampling procedure will be the same conventionally used, taking the total core recovered along the selected length for each sample. The minimum sampled length should be 1 meter per sample and the maximum length should be about 3 meters. The definition of the actual sampling intervals will depend on the characteristics of each coal seam and will be based on indications from the lithological and geophysical logs. The coal samples will be packed in plastic bags tightly closed, and dispatched to the laboratory.

b) The coal seams bulk sampling.

The coal seams bulk sampling program envisages to produce large volumes, representative, coal samples from the B₁, B₂ and B₃ coal seams for complete crushing and washability studies at bench scale. Two samples for each of the above mentioned seams will be collected each one weighing about 600 kg. Therefore six samples totalling 3,600 kg shall be produced.

The coal bulk samples will be collected as a continuous channel sample on fresh coal seam face, exposed through the excavation of a trench or of a exploration shallow shaft.

Other procedure which could be used is to drill a certain number of closely spaced large diameter DDH (HQ.6.35 cm core diameter) to collect a minimum of 500 kg of a particular coal seam.

In both cases the freshness of the material sampled and its representativity of that particular coal seam should be undisputable.

For the open cut or exploration shaft channel sample a larger volume will be collected say, of about 1,5 to 2 tons, which will be homogenized and quartered down to an aliquot of about 600 kg, before packing and shipping to the laboratory.

Each bulk sample will be packed in duty service plastic tags of about 60 kg each, labeled and closed tightly, to be sent to CPRM laboratories in Rio de Janeiro.

4. Study and interpretation of the results of the physical-chemical analysis and tests. A thorough examination of all analytical results will be made and the coal quality, coal rock and coal properties concerning to metallurgical and/or energetic uses will be assessed for each coal seam. Theoretical yields will also be calculated for specific ash content final products.

5. Data storage and processing

A computerized based data management system will be set up to the Mucanha-Vuzi coal deposit in order to allow the application of modern statistics and geostatistics methods of reserves evaluation, providing also a sound basis for a detailed spatial knowledge of the deposit, as well as for the upgrading of the mining plan and mining operation.

The system envisaged will have three data source archives, analysed samples data; drilling data and logging data. All data will be standardized before the preparation of the working matrix. At this stage, maps, isopach maps, geological sections and data control lists will be produced. The coal reserves evaluation could be achieved through the use of the conventional, statistics and geostatistics methods. A comparison between the results produced by the different evaluation methods is also

provided by the system.

The geostatistic technique, besides the coal reserves calculation, will also provide a rather detailed view of the morphology of the deposit and of the spatial distribution pattern of the relevant coal properties, which is of the utmost importance for the optimization of the mining and mining control process.

The data processing system will also produce grade/tonnage curves for different situations, maps and sections of mine blocks overburden evaluation maps etc.

All information about the coal deposit from the first phase exploration program will be used together with the new produced data from the second phase of exploration.

A.3.1.g - Coordination, Consulting and Final Report

During the whole period, the programme at a technical and administrative level, will be under the responsibility of two coordinators, one in Brazil and the other in Mozambique, both eventually assisted by specialist consultants recruited for specific tasks.

Aside from the technical, operational and administrative aspects of the programme, the coordinators will also be responsible for acting as liaison between CPRM, and GSECHI and other government departments of Mozambique, as well as the financing agents. They must present, whenever so required, to the contracting and financing agents any relevant information demanded.

CPRM will continue to maintain a permanent office in Maputo in order to make the contacts easy with the Mozambiquean authorities.

The consulting services will be contracted from specialists that work for CPRM or recruited from other Brazilian government-owned companies.

The Geological Exploration Final Report will contain all the data generated by the programme.

A.3.2 BASIC ENGINEERING DESIGN FOR
THE MUCUNHA/VUZI COAL OUTFLOW
TRANSPORTATION PROJECT

*A.3.2 - BASIC ENGINEERING DESIGN FOR THE MUCANHA-VUZI COAL OUTFLOW
TRANSPORTATION PROJECT*

The Companhia de Pesquisa de Recursos Minerais-CPRM, based on the result of the preliminary evaluation of the outflow alternatives for the coal production at the Mucanha-Vuzi Region foreseen in the activity 9 of the contract GSECHI/CPRM of 12.01.82 and subcontracted to the Empresa Brasileira de Planejamento de Transportes - GEIPOT, submits for the appraisal of the Cabinet of the State Secretariat for Coal and Hydrocarbons the proposal for the basic engineering design of the selected transport system.

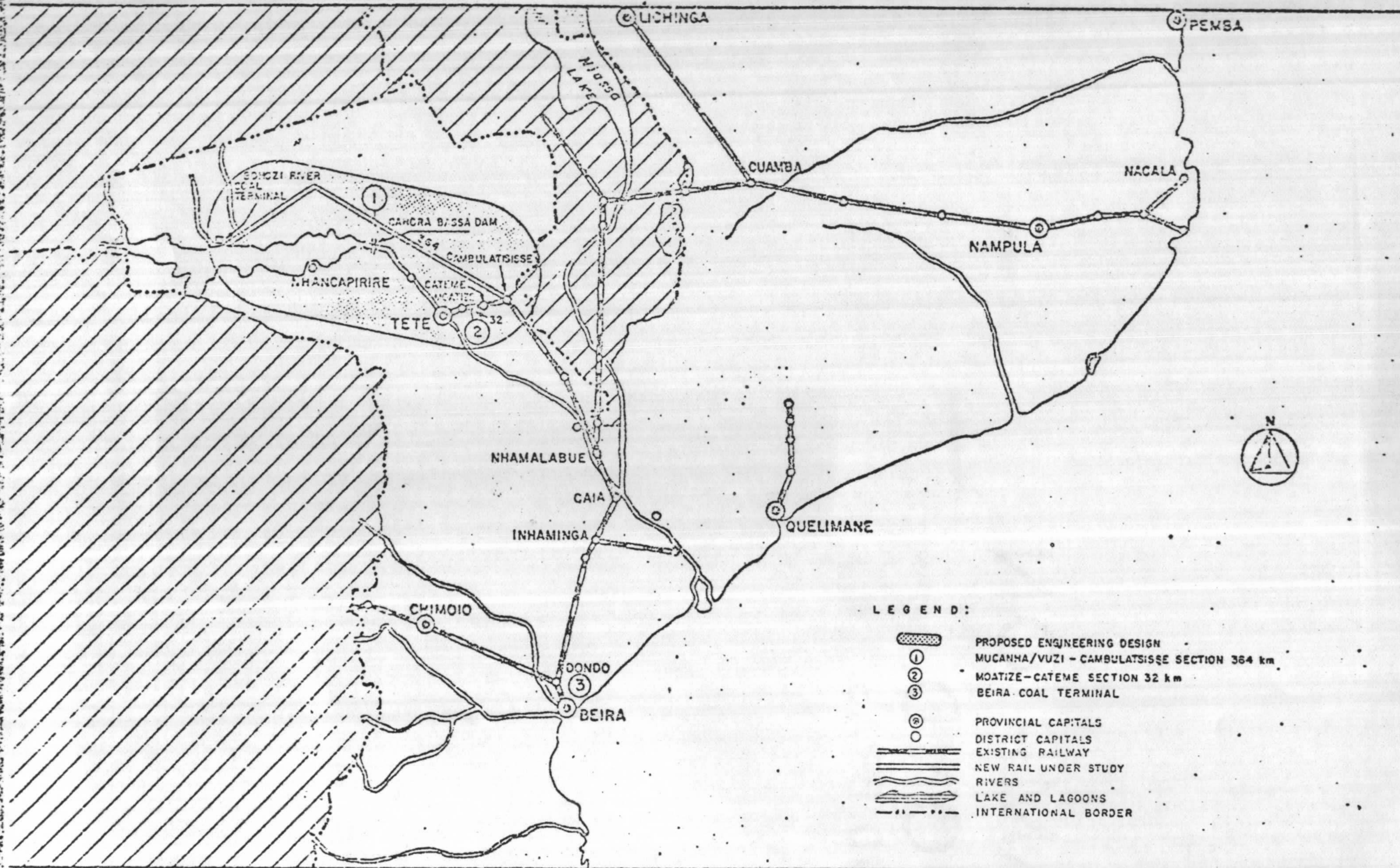
The execution of the basic design in the second phase of the Mucanha-Vuzi Programme, previously planned for inclusion in the third phase was anticipated due to the quantity and quality of data obtained in Mozambique, which made possible to achieve a highly reliable conclusion concerning the selection of the most economical mean of transportation for the Mucanha-vuzi coal.

In view of the reliability of existing data and the coal production target set by the Government of Mozambique, GEIPOT considered of utmost importance the basic design to be executed during 1983/1984, in order to allow the detailed design to be executed and the work to start in 1984/1985, so as the transportation system could be ready to start operating by 1989.



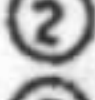








Thus, the scope and budget of present proposal differs from previous estimates submitted for consideration of the Mozambique and OPEC Fund since the previously assumed third phase of the programme was anticipated and incorporated into the second phase, thereby saving one year of time allotted in the previous schedule.

Based on the findings of the Study of Outflow Alternatives Report, the proposal for the Basic Engineering Design, is presented for the new sections to be constructed in Route 1 - Beira; Alternative 1.1 Northern and includes the

MT-GEIPOT



LEGEND:

-  PROPOSED ENGINEERING DESIGN
-  MUCANHA/VUZI - CAMBULATSISSE SECTION 364 km
-  MOATIZE - CATEME SECTION 32 km
-  BEIRA COAL TERMINAL
-  PROVINCIAL CAPITALS
-  DISTRICT CAPITALS
-  EXISTING RAILWAY
-  NEW RAIL UNDER STUDY
-  RIVERS
-  LAKE AND LAGOONS
-  INTERNATIONAL BORDER

STUDY OF OUTFLOW ALTERNATIVES

Route I - Beira - Alternative I.1 - Northern.

followings items:

- Loading Railway terminal close to the Bohozi River (Bohozi terminal);
- Construction of the railway connection between the Bohozi coal terminal and Cambulatsisse with 364 km in length;
- Construction of the Railway variant Moatize-Cateme (on the Moatize to Cambulatsisse line section);
- Construction of the coal terminal in the port of Beira.

Conforming to the agreements between Mozambique and other countries consulting firms for the rehabilitation and upgrading of the existing railway line in the CFM-Central System between Beira and Moatize, this proposal only includes the basic design for the Cateme variant. As for the Beira-Moatize Section, the work to be carried out will be limited to providing a conclusive report on the operation, including all basic details such as the length of the trains, axle load, average daily traffic and other operational data required to a perfect execution of the project.

The basic engineering design should provide the required information for the Mozambique Government to put out to tender a detailed engineering design and the execution of the civil engineering works and the purchase of equipment as well.

A.3.2.a - Basic Engineering Design for the Cambulatsisse to Mucanha-Vuzi Railway Section (loading terminal included) and the Cateme Variant.

WORKING PLAN

PURPOSE

- To draw up a Basic Engineering Design, with enough data to permit to put out to tender, and after detailing, the construction of the Cambulatsisse/Mucanha-Vuzi railway section

and Cateme Variant line, including its future operation.

- In order to save time and due to an existing study of the track, based on aerial photogrammetry on the 1:2,500 scale, a decision was taken for a more detailed project, specially in the first 140 km, and the development of the Executive Geometric Design. Based on all the studies carried out, there will be presented the Earthmoving, Draining and Complementary Works projects, that will enable the Mozambique Government to rapidly put out to tender and to contract the services of the substructure work.

METHODOLOGY

- The Cambulatsisse/Mucanha-Vuzi railway section will be divided into two lots for execution:

a) a lot of approximately 212 km long, which starts at Cambulatsisse, has been surveyed by aerial photography already. The track has been studied and a branch-line will be defined for the last 72 km of the section;

b) the initial term established for conclusion of the Basic Engineering Design will be expanded, according to the rainy season. It was decided to present only a part of the Executive Project for the first 140 km.

LOT NUM. 1

km 196 (CAMBULATSISSSE) - km 336

1st stage - OPTIMIZATION OF THE TRACK

The studied track in the preliminary report will be adapted to the required rules and technical conditions, resulting from geotechnical and operational studies.

2nd stage - DEFINITION OF THE EXECUTIVE GEOMETRIC PROJECT

Based on results of the topographic, geological, hydrological, geotechnical and track studies as well as operational simulation, a definition of the geometric features will be obtained and it will be a base to other basic and executive projects, for adequate implementation in site.

3rd stage - EXECUTIVE ENGINEERING DESIGN

Based on the Executive Geometric Design and other studies, it will be drawn up the executive Projects of Earthwork, Draining and Complementary Works; the Common Structures, Permanent Way, Telecommunications, Signalling and Licensing, Workshops, Maintenance Stations and Buildings, Rolling Stock and Maintenance Equipment, Basic Design and the Preliminary Design of Special Structures.

Quantities, Costs and Specifications for the Construction, as well as Budgets will be defined, in order to consolidate the projects.

Finally, the Construction Plans will be submitted.

LOT NUM. 2

km 336 - km 560 (MUCANHA)

1st stage - INTERMEDIATE OPTIMIZATION OF THE TRACK PLANS

In order to avoid the loss of sensitivity of the track studies when going from a 1:50,000 scale study to 1:2,000 scale track plan, there will be introduced at this stage a track optimization in a 1:10,000 scale. The track chosen in the 1:50,000 scale plan will be put into the same scale program and will undergo the initial optimization by mean of stereoscopic macro-analysis. There will be a delimitation of the range to be mapped.

The mapping will be executed in a 1:10,000 scale, with 5 meters equidistance, and graphic support will be based on existing charts and other support data available.

The geometric optimization will be in addition to the stereophotoanalysis and preliminary operational simulation.

A 1:10,000 scale geometry of the track, plan and profile will be produced.

2nd stage - DEFINITION OF THE BASIC GEOMETRIC DESIGN

The definition of the geometric aspects to serve as a basis for the remaining basic Design and which will be adequate for the correct implementation in site, will be based upon the topography, geology, hydrology, geotechnical and track studies as well as operational simulation.

3rd stage - BASIC ENGINEERING DESIGN

Based on the Basic Geometric Design and using the results of the remaining studies, the Basic Project for Earthmoving, Draining, Common Structures for the Permanent Way, Telecommunication, Signalling, Workshops and Maintenance Station, Buildings, Rolling Stock and Maintenance Equipment, Complementary Works and Special Structures Preliminary Project will be drawn up.

Quantities, Costs and Specification for the Construction, as well as the Budget will be defined in order to consolidate all projects.

Finally, the Construction Plan will be submitted.

Lot Num. 3

KM 0 (MOATIZE) - KM 31.5

CATEME VARIANT

Cateme Variant comprises the approximate length of 31.5 km and starts at Moatize mines, and it is included in the

Moatize-Cambulatsisse railway section, 58 km long.

There is a preliminary project for this section in a 1:10,000 scale which will be improved with similar methodology as to lot 2. The autonomy of this lot as to others and the proximity of Tete city, will permit that the presentation of works occur in a 8 months minimum term, depending upon the starting schedule, and will be detailed according to Basic and Executive Design.

DEFINITION OF TASKS

00 - MANAGEMENT

- a - Management for the preparation of the Basic Engineering Project;
- b - Overall management of activities.

01 - ANALYSIS OF THE EXISTING DATA

- a - Collection of elements and data for preparation of the works;
- b - Study of the data by qualified technical personnel.

02 - PRELIMINARY TOPOGRAPHIC STUDIES (LOT 2)

- a - Drawing of the track plans worked out in a 1:50,000 scale maps over existing photograms in the same scale;
- b - Delimitation of the range to be mapped with an average width 800 m;
- c - Expeditious aerophotogrametric mapping of the said range, in a 1:10,000 scale, with graphic support from the 1:50,000 scale maps and other available information.

03 - PRELIMINARY TRACK STUDIES (LOT 2)

- a - Geometric track optimization on the 1:10,000 scale expeditious mapping, with stereoscopic macro-analysis of the 1:50,000 scale photograms, in addition to the preliminary operational simulation.

04 - PRELIMINARY OPERATIONAL SIMULATION (LOT 2)

- a - Track operational simulation in a 1:10,000 scale map based upon the transport requirements and other previously obtained data, in addition to the geometric optimization.

05 - TOPOGRAPHIC STUDIES

- a - Implementation of the Main Traverse, 1:50,000 accuracy;
- b - Implementation of the Secondary Traverse, using the maximum as possible of the track traverse, 1:30,000 accuracy;
- c - Survey of the cross-sections, every 20 m, with 100 m extension both ways (lot 2);
- d - Survey of special areas (water-courses crossing points, deposits, etc.), 1:500 scale;
- e - Drawing of the delimited range based on the cross-sections in a 1:2,000 scale (lot 2);
- f - Center-line location for every 20 m (lot 1).

06 - GEOLOGICAL STUDIES

- a - Analysis of the existing geological studies;
- b - Preliminary geological photointerpretation;
- c - Field geological survey;
- d - Preparation of Geological Chart.

07 - HYDROLOGICAL STUDIES

- a - Analysis of the existing hydroclimatic data;
- b - Pluviometric studies;
- c - Fluviometric studies;
- d - Definition of the hydrographic basin characteristics;
- e - Definition of the project outputs;
- f - Definition of the maximum flood levels;
- g - Report on the studies carried out.

08 - GEOTHECNICAL STUDIES

- a - Preparation of the Drilling Plan based on data from geological studies;
- b - Preparation of the Plan for Geotechnical Field Tests and Laboratory Tests;
- c - Survey for Special Structures;
- d - Drilling, field and laboratory tests;
- e - Preparation of the Mine Search Plan, based on geological survey of the surface and on stereophotoanalysis, to obtain sand, rock and types of ground adequate for the construction;
- f - Drilling and tests needed for the search;
- g - Final Report.

09 - TRACK STUDIES

- a - Adaptation of track to the required rules and technical conditions resulting from studies (lot 1);
- b - Based on the results of the geologic, geotechnical and hydrologic studies, the critical crossing points will be plotted on the 1:2,000 scale range surveyed;
- c - The original 1:10,000 scale track plan will be optimized to a 1:2,000 scale, in addition to the operational simulation thus giving the definition for the geometric development of the line.

10 - OPERATIONAL SIMULATION

- a - Operational simulation in addition to the track study as well as the study of yards and terminals in a 1:2,500 scale, (lot 1);
- b - Amendment to the preliminary operational simulation of the 1:10,000 scale track plan with new 1:2,000 scale elements, in addition to the track study as well as the study of yards and terminals, (lot 2);
- c - Definition of the configuration of yards and terminals.

11 - I - EXECUTIVE GEOMETRIC PROJECT

- a - Definition of the geometric aspects with the data and accuracy required for their location;
- b - Execution of plans and profiles in a 1:2,000 horizontal and 1:2,000 vertical scale, with mapping of range in a average width of 120 meters and contour lines every 5 m with axis poles, with curves and slopes aspects, location of common and special structures so as the ground profile.

11 - II - BASIC GEOMETRIC PROJECT

- a - Definition of the geometric aspects with the data and accuracy required for their location during the stage of preparation of the Executive Project.

12 - I - EXECUTIVE EARTHWORK PROJECT (LOT 2)

- a - Definition of slopes for barriers and embankments;
- b - Definition of retaining walls works;
- c - Volumes of excavation in different classes of material;
- d - Volumes of compacted embankments;
- e - Quantification of services for retaining works;
- f - Guidance for earthmoving works, specifying the destination of excavated materials of different classes, such as embankments, borrow-pits, throw-offs, deposits of materials for the top layer and sub-ballast, with their average transportation distances;
- g - Quantification of volumes by types of materials and range of transportation distance;
- h - Drawings of the cross-section for every 20 m. in a 1:200 scale, and typical cross-sections;
- i - Presentation of the Earthmoving, service notes and of guidance schedules for Earthmoving, necessary for the execution of embankments.

12 - II - BASIC EARTHWORK PROJECT (LOT 1)

- a - Definition of slopes for barriers and for embankments;
- b - Definition of retaining wall works;
- c - Volumes of excavation in different classes of material;
- d - Volumes of compacted embankments;
- e - Quantification of services for retaining works;
- f - Guidance for earthmoving works, specifying the destination of excavated materials for different classes, embankments, borrow-pits, throw-offs, deposits of materials for top layer and sub-ballast, with their average transportation distances;
- g - Quantification of volumes by types of materials and range of transportation distance.

13 - I - EXECUTIVE DRAINAGE PROJECT (LOT 1)

- a - Preparation of the drainage projects in order to ensure the correct collection, transportation and disposal of water which could hinder the construction, their stability and operation, comprising:
 - Superficial draining,
 - Deep draining,
 - Sub-horizontal filter draining;
- b - Preparation of drainage work list including situation and measurement of the services required for the construction.

13 - II - BASIC DRAINAGE PROJECT (LOT 2)

- a - Preparation of the drainage projects in order to ensure the correct collection, transportation and disposal of water which could hinder the construction, their stability and operation, comprising:

- Superficial draining,
- Deep draining,
- Sub-horizontal filter draining.

14 - *BASIC COMMON STRUCTURES PROJ ETC*

- a - Project measurement and structural standardization of different types of common structures;
- b - Preparation of typical drawings.

15 - *SPECIAL STRUCTURES PRELIMINARY PLAN*

- a - The works and their general features will be defined based upon the geological, geotechnical and topographic surveys of the areas, as well as hydrological and fluvimetric data;
- b - Preparation of summary of calculation memory for each preliminary project;
- c - Applicable drawings to a scale of not less than 1:500.

16 - *BASIC DESIGN OF THE PERMANENT WAY*

- a - Measurement of the elements which make up the permanent way based on traffic volume, train-type used, axle load, locomotives and cars, maximum speed limitations and other operational data;
- b - Definition of the following track elements:
 - Sub-ballast and ballast,
 - Sleepers,
 - Fastening,
 - Rail Cars, junctions and turnout equipment.

17 - *BASIC TELECOMMUNICATIONS PROJECTS*

- a - System conception;
- b - Dimension in the telecommunications area to meet the basic requirements set out in the operational simulation.

- 18 - *BASIC SIGNALLING AND COMMUNICATIONS PROJECT*
- a - System conception;
 - b - Dimension in the signalling and communication area to meet the basic requirement as set in the operational simulation.
- 19 - *BASIC DESIGN WORKSHOPS AND MAINTENANCE*
- a - Definition of location and measurement of facilities for locomotive workshops and railway cars;
 - b - Definition of location and measurement of facilities for maintenance and service stations.
- 20 - *BASIC BUILDING DESIGN*
- a - Definition and measurements of buildings in sufficient detail to establish quantities, specifications and implementation costs.
- 21 - *ROLLING STOCK AND MAINTENANCE EQUIPMENT*
- a - Definition of quantity and specifications for locomotives fleet and railway cars needed to meet project demand, allowing for integration as far as Port of Beira.
- 22 - I - *EXECUTIVE DESIGN FOR COMPLEMENTARY WORKS (LOT 2)*
- a - Definition and measurement for complementary work and facilities needed for the railway operation.
- 22 - II - *BASIC DESIGN FOR COMPLEMENTARY WORKS (LOT 2)*
- a - Definition and measurement for complementary work and facilities needed for the railway operation.
- 23 - *QUANTITIES, COSTS, SPECIFICATIONS AND BUDGETS*
- a - Market research;
 - b - Definition of specification and quantity for materials

and equipment, based on the solutions found in the projects, including unit costs;

c - Preparation of budgets.

24 - CONSTRUCTION PLANS

a - Preparation of chronogram, methodology and division into construction sites;

b - Preparation of bid notices, norms and procedures for implementation of the works and equipment procurement.

. WORK ORGANIZATIONS

The works on the Cambulatsisse-Mucanha Railway section and Cateme Variant, will be developed based on two main locals:

a - Mozambique - City of Tete

The installment of a Technical Residence is intended with equipment for Technological Tests and Topographic crew collecting the necessary data to the project development. Accurate tests will be carried out in the Engineering Laboratory of Mozambique in Maputo.

Thus it is foreseen the following evolution:

Exploration Traverse, center-line location and delimited range

- Surface Geology
- Drillings
- Collecting of samples
- Topographic surveys
- Mining Studies
- Data collection of Permanent Way, Workshop and Systems of existing tracks
- Special Geotechnical drilling for the Systems
- Special Topographic surveys for the Systems.

Residence in Tete

- Geotechnical Tests
- Topographic drawing of delimited range, in "Canson" paper.

Engineering Laboratory of Mozambique

- Special Tests that will not be made in Tete.

b - Brazil

Definitive drawing of delimited range based on the "Canson" sent by Tete.

The draft of the Basic and Executive Project will be developed and submitted to the Government of Mozambique and Technical Advisers of OPEC. After approval it will be issued the Definitive Edition of Final Report.

A.3.2.b - Basic Engineering design for the Beira Coal Terminal and Access Routes.

The selected route indicated in the Report (Route 1, Alternative 1.1) foresees the execution of an ocean terminal at Beira in the so-called Franquia point.

For the Beira coal terminal, the following activities will be executed:

. Field Survey

- *Topographic Survey*

In the area considered for the basic engineering design a topographic survey will be carried out, to include topographic support by the close polygonal system, transportation of the reference levels at a levelling distance of 1 m. The estimated area in the port of Beira is 900,000 m².

An investigation of the surrounding area of about 200,000 m² should be executed, indicating the physical existence of all buildings and streets, bridges, etc.

All control points is to be fixed with concrete blocks with metal pine for the local reference of future construction works.

Total Area to be Surveyed: 2,400,000 m².

Geological Surveys

Geological drillings of NX diameter will be made for a 13 drill hole on land and 12 in the water (35 m/DDH).

Other Local Survey

The following survey will be carried out:

- In the waterfront: wind, wave, tide, current (checking of the existing data);
- In the construction area: electric power requirements for water and sewage installation, etc.

Basic Design of the Terminal

The basic engineering design of the coal export terminal ships between 15,000 DWT and 125,000 DWT shall include:

- unloading installations of the railway cars (civil engineering work and equipment);
- stock pile area (civil engineering work and equipment);
- reclaiming equipment and transferring to pier at a distance of 2,700 m (civil engineering work and equipment);
- pier and access bridge (civil engineering work and equipment);
- railway and road access routes;

- administration and service buildings;
- maritime access - signalization and buoys;
- dredging project;
- electricity, water, sewage and communications.

A.3.2.c - General Coordination, Assistance and Supervision of the Transportation Projects.

General Coordination and Supervision of the Basic Engineering Design for the new segments of the transportation system will be under CPRM responsibility with the assistance of GEIPOT if contracted for the coordination and supervision work.

The activities to be developed will be:

- preparation of bid notices, norms and procedures for contracting specialized firms for the Basic Engineering Design of the proposed segments of the transportation system.
- selection of specialized firms for the engineering design transportation project and field survey.
- follow-up and coordination of the transport project to ensure high quality and international standard design.

A.3.2.d - Review of the Costs and Financial Aspects.

Based upon the new budget resulting from the Basic and Executive Engineering design and new data and forecasts on coal freight demand, a review of the economic and financial aspects resulting from rail and ocean terminal operation given in the preliminary report is to be carried on.

A.3.2.e - Training Program of Human Resource for Operating the New Coal Transportation System.

A quantitative and qualitative evaluation of the human resources available at the Ministry of Ports and Surface Transport, is to be undertaken, in particular with regard to the

National Directorate of Port and Railways as well as to other organizations in other Ministries, such as the National Directorate of Maritime and Waterway Transport and the National Directorate of Waters.

Recommendation shall be made for the setting up of a programme of selection and training covering several levels of professional categories during the various stages of the project development.

A. 3. 3 BASIC MINING PROJECT, COAL
PREPARATION PLANT AND AUXILIARY
FACILITIES-ECONOMICAL AND
FINANCIAL FEASIBILITY STUD

A.3.3 BASIC MINE PROJECT, COAL PREPARATION PLANTS AND AUXILIARY FACILITIES-ECONOMICAL AND FINANCIAL FEASIBILITY STUDIES

Engineering services herein proposed consist of developing the following activities:

. Basic Project

This cover the concept of the Production, Auxiliary and Administrative Units as well as the Utilities System and the Access System.

During this stage, sizing and specification of equipment, preparation of layouts of buildings and facilities, will be carried out.

. Economical-Financial Feasibility Study

This covers carrying out the Market Study and the preparation of the Investment Budget, determining operating costs, income, pay back period, internal rate of return; as well as elaborating sensitivity analysis.

The development of these Engineering activities will allow the subsequent stages of the Project to be initiated, as follows:

- . Negotiation of Financing,
- . Equipment Procurement,
- . Project Designs
- . Contracting out the Civil and Building Works.

The scope of the engineering activities to be developed during this stage is broken down as follows:

A.3.3.a General Coordination

During the whole period envisaged for the services, a coordination structure allowing a perfect integration of all companies involved, will be established.

The basic function of this Coordination Staff will be the close follow-up of the geological ^{exploration} research services, as well as of those services related to the transportation project, utilizing the data and solutions adopted in the Mining Project and in the Feasibility Study.

The Coordination Staff will also be assigned the responsibility for the edition of periodic reports, which shall include the description and evaluation of the services, in terms of their application in both the Basic Project and the Feasibility Study.

A.3.3.b Mining Project

Considering the information resulting from the additional geological ^{exploration} research, and, taking into account that investment on mining projects are irreversible, the alternatives for the mining methods shall be analyzed, mainly concerning to haulage, aiming at the minimization of the global mining costs within the context of the integrated mining/preparation and refuse disposal complex.

Taking into consideration both the technological and geologic-structural features of the coal seams, mining plans shall be computer simulated, looking for the optimization of the cost/income function of the integrated mining/preparation and products transportation complex.

For the analysis of alternative mining methods, computer simulated global mining plans shall be effected, in order to evaluate the behaviour of the so-called "benefit function".

For the choosen alternative, short and medium-term plans shall be elaborated to show the feasibility of accomplishing the required production program.

These plans shall also serve as a basis for the forecast of the requirements for the effective accomplishment of the production program, by demonstrating the physical and chronological evolution of the mine.

Based on such mining plans the sizing of equipment for each phase of the mine evolution will be done.

Material and input consumptions, as well as manpower requirements, shall be precisely evaluated.

Equipment, materials and inputs shall then be specified, in order to allow procurement and to assure that they will meet the requirements.

The short-term mining plan shall also serve for the specification and budgeting of the detailed geological research and the initial mine development works.

The process of removing, handling and disposing soil over the wasted coal refuse piles shall be given special attention.

Due to the time required for the mine development works, 6-month, 3-month and 1-month mining plans shall be prepared so as to pre-establish a planning and control routine.

In view of the time required for large-sized mining equipment deliveries and assemblies, and the large investments required for said equipment, a mine implantation schedule shall be prepared, favoring the Project cash-flow, and, also allowing the planning and operating teams to foresee the organization and control of such activities, as well as the training of personnel.

A.3.3.c Coal Preparation Project

Definition of the Mixture of Products

The most adequate mixture of products will be determined by the Market Study and washability tests which will show the consumption profile and the yields for the various ash contents.

Definition of the Process

The Coal Preparation Project will be based on washability studies to be done individually for each seam to be mined. After a more detailed geological survey of the deposit, sampling locations will be defined and bulk samples taken, in effort to simulate actual mining conditions. Washability studies will cover various crushing sizes and granulometric fractions, allowing the study of liberation and washability of the various size ranges.

The preparation of the fine fraction, -0.5mm, will be given special attention, in view of its great contribution to the amount of metallurgical coal to be produced, as seen in the Preliminary Feasibility Study. The various alternatives of using cleaning Water - only Cyclones, and small diameter heavy-medium cyclones will be considered.

Preliminary flotation tests, carried out at the time of the Preliminary Feasibility Study, gave a bad results for coal from Seam B-1. However, additional flotation tests shall be done at bench scales, mainly with coals from Seams B-2 and B-3.

The industrial application of Water - only cyclones will have to be continued by specific tests, in laboratory or pilot plant.

The use of heavy-medium cyclones to clean fine coal (0.5mm x 0.074 mm) will be considered, even though this is a recent technological development.

Computer simulations of the various process alternatives will be carried out, in order to select the best process and determining the yields of marketable products for each seam.

Based on required production capacity, yields, and mineable surface reserves, the mix from the various seams to be mined, the preparation plant feed rates and mixes can be defined.

The chosen alternative process will have to be optimized for the feeds thus defined, allowing for the preparation of the specification for necessary equipments.

A.3.3.d Layouts of the coal preparation and auxiliary facilities and miners village project

Coal preparation facilities

Layout drawings of the crushing plant, washery and handling, storage and blending facilities, as well as the coal load-out yard, will be prepared.

These drawings will give an overview of all equipment presented in the flowsheet, as well as the equipment not directly connected with the production process, such as overhead electric traveling cranes or monorail hoists.

Industrial buildings as well as auxiliary facilities such as the compressor house, sanitary installations, etc. will be shown in these layout drawings, making possible the forecast of the amount of structural material (concrete or metal) for budgetary purposes.

During this stage, handling equipment-conveyor belts, stackers, reclaimers, etc. - will also be specified.

Auxiliary Facilities

Auxiliary and Support Facilities will be sized to meet the requirements of maintenance, administration and operating personnel of the Mine.

Such facilities include Maintenance Shops, Vehicle Repair Shop, Warehouse, Laboratory, Explosives Room; Offices, Changehouse, Restaurant and First Aid Room.

Drawings will be prepared of the buildings showing their division in functional sections, and each one of these with its own equipment, furniture and fixtures.

The construction methods for the buildings will be described, taking into account materials and labour available in Mozambique; specifications for shop equipment and for the other Auxiliary Facilities will be elaborated.

Miners Village

The final project for the Miners Village will be developed from the Project in the Preliminary Feasibility Study and dully analized and approved by the Mozambique Housing Authority.

The Miners Village will be sized to house all personnel directly and indirectly connected with the Coal Mining Project and will be equipped with its own operating infrastructure, such as Hospital, School, Leisure Centre, Shopping Center, etc.

The location will be choosen based on geographical conditions such as topography, type of soil, landscape, wind direction, climatic conditions, etc.

The location and the size of the Miners Village will also be considered, as to its use by other Projects which may establish in the Region as a result of the Coal Mining Project.

A.3.3.e Utilities, Instrumentation, Electric Power, Piping and Roadway

The drinking and industrial water supplies, electric power, instrumentation and access road to the facilities will be studied.

Specifications for equipment as well as general specifications for materials, Civil and Construction works will be prepared.

Drinking Water

Sources of drinking water will be evaluted in regards to quantity an quality, by means of field inspection, measuring the flow and analizing of drinkability. Once the source is selected, a basic project will be prepared encompassing intake, storage ,

distribution and eventually treatment for the water for the industrial facilities and the Miners Village.

Industrial Water

The region is blessed with an abundance of industrial water, be it from the dam or from the rivers. From the currently available information, it seems most interesting to take water from the dam and pump it to the industrial facilities for storage and consumption.

Electric Power

Supply of electric power by the Cahora-Bassa, by means of a transmission line to the facilities will be studied. At this time the voltage level of the line will be set, in addition to its route based on aerophotogrametric survey.

General One Line Diagrams and Drawing will also be prepared of the general lay-out of the main substation, and of the distribution lines to the consuming centres - Mine, Coal Preparation, Miners Village, etc.

Instrumentation

Considering the level of automation required by coal preparation equipment - a diagram will be prepared showing all instruments, their function and locations within the production process.

Instrumentation will be held to a level, where sophisticated items requiring highly specialized labour for operation and maintenance be not needed and also so that it does not substitute abundant and low cost local labour.

Roadway

A basic project will be prepared for the roadway, some 70 km long connecting the local of Nhataro to the coal mining facilities. Drawings, on a scale of 1:5000, will be made based on aerophotogrametric surveys, as well as to profiles of the major items to be constructed, such as bridges and viaducts.

It will be a 8 meter width gravel road similar to the one currently giving access to Nhataro.

A.3.3.f Market, Budget, Economical, Financial and Social Feasibility Studies

Market Study

- . Analysis of Supply
 - . Survey of world coal reserves;
 - . Survey of production capacity per country (or region) and by type of coal, as well as expansion plans (estimated capacity in the coming 20 years);
 - . Determination of the capacities of coal exporting harbours as well as their expansion plans.

- . Analysis of Demand
 - . Survey of consumption and type coal per country during the past 10 years;
 - . Identification of the main factors which influence the demand and determine usage trends. Survey of oil-coal conversion programmes in the main consuming regions and world profile of energy consumption;
 - . Projection of demand by type of coal and country (or region) for the coming 20 years.

- . Analysis of Demand/Supply
 - . Identification of self-sufficient countries by type of coal;

- . Identification of importing/exporting countries (or regions);
- . Projection of International Coal Trade in the coming 20 years.
- . Price Analysis
 - . Survey of prices by origin and type of coal;
 - . Identification of the factors that influence coal prices;
 - . Evaluation of trends of price evaluation;
 - . Determination of transportation costs (maritime and land transport)
- . Supply by Project
 - . Estimate of domestic consumption of the Mucanha Vuzi coal;
 - . Estimate of demand by neighbouring countries for the Mucanha-Vuzi coal;
 - . Identification of potential markets for the Mucanha-Vuzi coal.
- . Budget

Definition of the Project's budgetary expenditures, identifying them by area such as : Mining, Coal Preparation, Auxiliary Facilities, Access Roadway and Railway, Infrastructure in general, and the Miners Village.

Economical-Financial and Social Feasibility Study

The Economical, Financial and Social Feasibility Study shall encompass:

- a) *Overall Investment*
 - . Determination of the Fixed Investment and Pre-operating Expenses;

- . Determination of the Working Capital;
- . Establishment of a Physical-Financial Schedule.

b) Sources and Funds

- . Analysis and evaluation of financial capacity of the People's Republic of Mozambique to invest in the Project;
- . Identification of other financing sources.

c) Location

- . Aspects of the Deposit Location;
- . Aspects of the Port Location;
- . Social-Economical Analysis;
- . Aspects of Social and Industrial Infrastructure;
- . Transportation.

d) Organization, Human Resources and Wages

- . Organizational Structure;
- . Manpower;
- . Wages and benefits.

e) Operating Costs and Expenses

- . Mining and Coal Preparation Operating Costs;
- . Freight rates from the Mine to the Port (railway and port expenses with storage and shipment);
- . Sales Expenses;
- . General Administrative Expenses;
- . Financial Expenses;
- . Depreciation, Amortization and Depletion.

f) Project Income

- . Income from Coal;
- . Other Income.

g) Economical, Financial Evaluation

- . Adopted considerations and assumptions;
- . Forecast of Profit and Loss
- . Forecast of Cash Flow;
- . Forecast for Uses and Sources;
- . Forecast on Balance Sheets;
- . Calculation of the Pay-Back period;
- . Calculation of Internal Rate of Return.

1) Social-Economical Evaluation

- . General considerations from the Mozambique social-economical viewpoint;
- . Impact of the enterprise on the economic development of Mozambique take-off;
- . Gross aggregate worth of the Project;
- . Impact of the Project on generation of jobs, and salaries;
- . Impact of Project on generation of foreign currency.

*A. 3.4 STUDIES OF ALTERNATIVES FOR
INTEGRATED REGIONAL DEVELOPMENT
AND LAND OCCUPATION
MIDDLE ZAMBEZE*

A.3.4 *STUDIES OF ALTERNATIVES FOR INTEGRATED REGIONAL DEVELOPMENT
AND LAND OCCUPATION - MIDDLE ZAMBEZE*

The dearth of information of a realible nature concerning the region which would become accessible for utilisation as farmland as an outcome of the laying of the Mucanha-Vúzi Railroad counsels against the immediate drafting of any project or even preliminary project with that end in view. Hence the need for a merely indicative approach of policies of action that seem feasible as a general orientation to be eventually detailed.

The region is actually vast and very little, if any, knowledge is available concerning its agricultural potential. It is considered to be the zone comprised within a rectangle drawn between the localities of Tete-Cambulatisse-Cherize river-Songo, with an area of 11,000 km². The indication of that area stems from the little information available, which have made it possible to infer it is of substantial interest to the object in mind.

Owing to the little information at present available, it is suggested that studies should be carried on in various stages in order to provide a growing familiarity with the region for the improved planning of the use of the land in economic activities.

Those stages may be classed as follows:

1. Basic Study and Selection of Areas
2. Agricultural Planning
3. Implementation of Projects

The present proposal refers exclusively to the first stage, comprising the Basic Studies - inasmuch as the ensuing stages are functions of the first.

A.3.4.a First Stage

Basic Studies and Selection of Areas

This stage will be comprised of a series of studies aimed at providing improved acquaintance with those features of the

region that are relevant to farmland planning. These studies are:

- . Studies on the climate
- . Studies on forest resources
- . Studies on soil resources
- . Studies on fish farming

A.3.4.b Studies on the Climate

- . Collection of data existing at weather stations in the region and neighbouring areas
- . analysis of data
- . characterisation of the climate of the region

A.3.4.c Study on Soil Resources

This is to comprise two levels:

Reconnaissance Survey

Exploration Survey

This study, of a general nature, is to comprise an area of approximately (140 x 80 km) 11,200 km² in the region at interest. Its purpose will be to ascertain, on a first approach, the condition of the soils of the region, particularly touching their farmability and to pick out those areas that seem most promising, to be the object of thorougher study on a reconnaissance level.

This study will be carried out through the intensive application of the technique of photointerpretation and air-land correlation with paths and study points selected from the aerial photos, so as to afford the work on the field the utmost efficiency.

As an outcome of those studies, a soil map will be drawn on a scale between, say 1:250,000 and 1:500,000, depending on the available mapping, to show the principal groups of soils existing in the region and the areas that seem most apt for farming and therefore should have their soils more accurately surveyed.

During that work soil sampling will be done for lab analyses. Some 200 samples should be evaluated in a preliminary approach.

A.3.4.d Reconnaissance Survey

In areas that the exploratory researches indicate as favourable to farming development, soil resources will be the object of thorough study on a reconnaissance or semi-detailed level to make it possible to prepare the corresponding farming plans according to the aptness of the lands so as to enable permanent farming without deterioration of the particular capabilities of the soil.

A.3.4.e Forest Studies

These will consist of an investigation to determine the types of forests and the flora of the vegetation and evaluate its economically exploitable potential.

Part of the work will be done in indoor facilities, including that of analysing and interpreting the aerial photographs and satellite images (if any). Part will be done on the field, for the purpose of measuring and evaluating tree quality. Such estimates will be made by sampling the areas covered by different types of forest as identified, and the average volume of timber per hectare for each forest type (dense rainland forest, semi-deciduous forest, sparse bush, etc.).

A.3.4.f Fish Farming Studies

These studies will be based on a survey of the physical and chemical and biological properties of the waters of the Cahora-Bassa dam and the rivers in the region through information gathered in the country and complemented by such new analyses as may be required in order to ascertain their fitness for fish farming.

A survey of the number and identity of the native species will also be made with a view to ascertaining their productive potential under handling.

Preliminary researches will likewise address the selection of natural bodies of water and the feasibility of the alternative

construction of tanks and ponds for fish breeding.

Depending on preliminary observations at the site, an indication will be made for the installation of a fish farming station designed for systematic biological researches in support of the exploratory activities and the production of fry and fingerlings to spread fish farming over the region.

DETAILED BUDGET - TOTAL

	Activities	Value US\$
Geological Research	1 - Surface and Subsurface Geological Services	684,767
	2 - Drilling Campaign	4,353,571
	3 - Geophysical Profiling	432,156
	4 - Chemical and Technological Analysis	621,019
	5 - Detailed Topographical Survey	971,653
	6 - Data Compilation and Processing	802,064
	7 - Coordination, Consultancy and Final Report	488,469
	SUB-TOTAL 01	8,353,699
Special Studies	1 - Studies of Alternatives for Integrated Regional Development and Land Occupation - Midle Zambeze	466,065
	SUB-TOTAL 02	466,065
Transport System Basic Project	1 - Basic Project - Railway Mucanha-Cambulatsisse-Cateme variant	7,466,708
	2 - Basic Project - Mucanha & Beira Terminals, Access Routes	924,510
	3 - General Coordination - Assistance & Supervision-Transport Projects	575,557
	4 - Review of Costs and Financial Aspects	190,451
	5 - Training Program of Human Resources in Transportation	122,033
	SUB-TOTAL 03	9,279,259
Basic Mine Project & Feasibility Study	1 - General Coordination	294,615
	2 - Mining Project	167,424
	3 - Coal Preparation Project	257,467
	4 - Layouts of the Coal Preparation and Auxiliary Facilities and Miners Village Project ...	483,638
	5 - Utilities, Instrumentation, Electric Power, Piping and Roadway	711,643
	6 - Market Study, Budget, Economical, Financial and Social Feasibility Study	234,147
	SUB-TOTAL 04	2,148,934
	GENERAL TOTAL 01 + 02 + 03 + 04	20,247,957

DETAILED BUDGET - EXTERNAL COSTS

	Activities	Value US\$
Geological Research	1 - Surface and Subsurface Geological Services	558,672
	2 - Drilling Campaign	3,652,817
	3 - Geophysical Profiling	411,267
	4 - Chemical and Technological Analysis	621,019
	5 - Detailed Topographical Survey	853,169
	6 - Data Compilation and Processing	754,744
	7 - Coordination, Consultancy and Final Report	484,465
	SUB-TOTAL 01	7,336,153
Special Studies	1 - Studies of Alternatives for Integrated Regional Development and Land Occupation, Middle Zambeze	425,410
	SUB-TOTAL 02	425,410
Transport System Basic Project	1 - Basic Project - Railway Mucanha-Cambulatsisse-Cateme variant	7,312,310
	2 - Basic Project - Mucanha & Beira Terminals, Access Routes	916,956
	3 - General Coordination, Assistance & Supervision-Transport Projects	569,837
	4 - Review of Costs and Financial Aspects	187,877
	5 - Training Program of Human Resources in Transportation	121,175
	SUB-TOTAL 03	9,108,155
Basic Mine Project & Feasibility Study	1 - General Coordination	292,635
	2 - Mining Project	166,434
	3 - Coal Preparation Project	256,477
	4 - Layouts of the Coal Preparation and Auxiliary Facilities and Miners Village Project ...	481,658
	5 - Utilities, Instrumentation, Electric Power, Piping and Roadway	709,663
	6 - Market Study, Budget, Economical, Financial and Social Feasibility Study	232,167
	SUB-TOTAL 04	2,139,034
	GENERAL TOTAL 01 + 02 + 03 + 04	19,008,752

DETAILED BUDGET - INTERNAL COSTS

	Activities	Value US\$
Geological Research	1 - Surface and Subsurface Geological Services	126,095
	2 - Drilling Campaign	700,754
	3 - Geophysical Profiling	20,889
	4 - Chemical and Technological Analysis	-
	5 - Detailed Topographical Survey	118,484
	6 - Data Compilation and Processing	47,320
	7 - Coordination, Consultancy and Final Report	4,004
	SUB-TOTAL 01	1,017,546
Special Studies	1 - Studies of Alternatives for Integrated Regional Development and Land Occupation - Middle Zambeze	40,655
	SUB-TOTAL 02	40,655
Transport System Basic Project	1 - Basic Project - Railway Mucanha-Cambulatsisse-Cateme variant	154,398
	2 - Basic Project - Mucanha & Beira Terminals, Access Routes	7,554
	3 - General Coordination - Assistance & Supervision-Transport Projects	5,720
	4 - Review of Costs and Financial Aspects	2,574
	5 - Training Program of Human Resources in Transportation	858
	SUB-TOTAL 03	171,104
Basic Mine Project & Feasibility Study	1 - General Coordination	1,980
	2 - Mining Project	990
	3 - Coal Preparation Project	990
	4 - Layouts of the Coal Preparation and Auxiliary Facilities and Miners Village Project ...	1,980
	5 - Utilities, Instrumentation, Electric Power, Piping and Roadway	1,980
	6 - Market Study, Budget, Economical, Financial and Social Feasibility Study	1,980
	SUB-TOTAL 04	9,900
	GENERAL TOTAL 01 + 02 + 03 + 04	1,239,205

B.1 - DETAILED BUDGET

The execution of the services, objective of this Proposal, is covered by the budget evaluation which is presented according to activities on the following pages.

PROGRAMA / MUCANHA VUZI / PROGRAM

PHASE II

CRONOGRAMA FÍSICO DE EXECUÇÃO (IMPLEMENTATION SCHEDULE)

	ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
GEOLOGICAL RESEARCH	1 - SURFACE AND SUBSURFACE GEOLOGICAL SERVICES																										
	2 - DRILLING CAMPAIGN																										
	3 - GEOPHYSICAL PROFILING																										
	4 - CHEMICAL AND TECHNOLOGICAL ANALYSIS																										
	5 - DETAILED TOPOGRAPHICAL SURVEY																										
	6 - DATA COMPILATION AND PROCESSING																										
	7 - COORDINATION, CONSULTANCY AND FINAL REPORT																										
SPECIAL STUDIES	1 - STUDIES OF ALTERNATIVES FOR INTEGRATED REGIONAL DEVELOPMENT AND LAND OCCUPATION - MIDDLE ZAMBEZE																										
TRANSPORT SYSTEM BASIC PROJECT	1 - BASIC PROJECT - RAILWAY MUCANHA - CAMBULATSISSE - CATEME VARIANT																										
	2 - BASIC PROJECT - MUCANHA & BEIRA TERMINALS, ACCESS ROUTES																										
	3 - GENERAL COORDINATION - ASSISTENCE & SUPERVISION - TRANSPORT PROJECTS																										
	4 - REVIEW OF COSTS AND FINANCIAL ASPECTS																										
	5 - TRAINING PROGRAM OF HUMAN RESOURCES IN TRANSPORTATION																										
BASIC MINE PROJECT & FEASIBILITY STUDY	1 - GENERAL COORDINATION																										
	2 - MINING PROJECT																										
	3 - COAL PREPARATION PROJECT																										
	4 - LAYOUTS OF THE COAL PREPARATION AND AUXILIARY FACILITIES AND MINERS VILLAGE PROJECT																										
	5 - UTILITIES, INSTRUMENTATION, ELECTRIC POWER, PIPING AND ROADWAY																										
	6 - MARKET STUDY, BUDGET, ECONOMICAL, FINANCIAL AND SOCIAL FEASIBILITY STUDY																										

B.2 - BUDGET COMPOSITION: ELEMENTS COMPRISED

I - Explanatory Notes

I.1 - The Government of Mozambique commits itself to undertaking the following costs which are not included in this Technical and Commercial Proposal.

a) All custom duties and taxes relative to the import of goods and equipment necessary for the execution of the programmed work. This represents about 13% of the CIF value of the equipment.

b) Utilization of Mozambique technicians for the coordination and support services at institutes and agencies of the Mozambique Government, which represent a quantity of US\$... 30,000.00.

I.2 - To prepare the budget, the following values were attributed to man-power to be used for the services:

	<u>US\$/Month</u>
a) Brazilian Personnel	
a.1) Engineer, Geologist or Economist, on a Consultancy or Coordination level (C)	
Basic wage & Social Benefits	6,000
Living Allowance -- monthly	2,100
Per Day Allowance Abroad	150
a.2) Engineer, Geologist or Economist, Senior 1 (Sr. 1)	
Basic Wage & Social Benefits	5,370
Living Allowance	2,100
Per Day Allowance Abroad	150
a.3) Engineer, Geologist or Economist, Senior 2 (Sr.2)	
Basic Wage & Social Benefits	4,800
Living Allowance	2,100
Per Day Allowance Abroad	150

a.4) Engineer, Geologist or Economist Junior (Jr)	4,294
Basic Wage & Social Benefits	3,220
Living Allowance	1,800
Per Day Allowance Abroad	110
a.5) Project Designer, Prospector, etc Senior Tec. (T.Sr.)	3,220
Basic Wage & Social Benefits	4,294
Living Allowance	1,800
Per Day Allowance Abroad	120
a.6) Mining Technician, Driller, Mechanic, Draftsman - Tec. Junior 1 (T.Jr.1)	3,220
Basic Wage & Social Benefits	1,800
Living Allowance	110
Per Day Allowance	
a.7) Drilling Assistant, Drivers, etc Tec. Junior (T.Jr.2)	2,500
Basic Wage & Social Benefits	1,400
Living Allowance	100
Per Day Allowance	
a.8) Administrative Assistants, Draftsman, etc Support Technicians (Ap. Tec.)	2,147
Basic Wage & Social Benefits	1,400
Living Allowance	100
Per Day Allowance	
b) Mozambiquean Personnel	
b.1) Technician (T)	
Basic Wage & Social Benefits	1,130
b.2) Qualified Personnel (Q)	
Basic Wage & Social Benefits	565
b.3) Non-qualified Personnel (N)	
Basic Wage & Social Benefits	170
b.4) Drivers (M)	
Basic Wage & Social Benefits	340

I.3 - For cost effect, the prices taken into consideration were those of October 1982.

I.4 - The Indirect Costs and Profit were calculated by applying the tariff of 20% over personnel costs and 10% over expenses with usage and consumer material, and services of third parties.

II - Detailed Composition

The detailed budget presented in the following pages covers the following items, according to activities:

*B.II.1 - GEOLOGICAL EXPLORATION
PROGRAMME*

B.II.1.a - Surface and Sub-surface Geological and Hydrogeological Services.

- . All expenditures with personnel, i.e. direct and indirect wages, social, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.
- . Group: 01 (one) Senior Geologist 01
 01 (one) Senior Geologist 02
 01 (one) Junior Geologist
 02 (two) Mining Technician-Junior Tec. 01
 Mozambiquean Personnel
 05 (five) Specialized Assistants - PQ
 03 (three) - Drivers - M
 10 (ten) Field Assistants - PNQ
- . All expenditures consequent upon the contracting of support personnel in Mozambique, such as drivers and auxiliary staff;
- . All expenditures (including insurance) incurred in the transfer (both ways) of all necessary equipment and materials, as well as rentals;
- . All costs described in item A.3.1.a referred to field analytical laboratory and office services;
- . All expenditures due to communications and transportation of water, coal and rock samples from Mozambique to Brazil;
- . Detailed Budget

	US\$	
	EXTERNAL	INTERNAL

a) Wages and Social Costs

a.1) Brazilians

01 Senior Geologist 01

- 13 M/month

69,810

	USS	
	EXTERNAL	INTERNAL
01 Senior Hydrogeologist 02		
- 13 M/month	62,400	
01 Junior Geologist		
- 13 M/month	41,860	
02 Mining Tec. Junior		
- Junior Tec.-26M/month	<u>83,720</u>	
65 M/month	257,790	
a.2) Mozambiqueans		
05 Specialized Assist.		
PQ - 60 M/month		33,900
03 Drivers-M-36 M/month		12,240
10 Field Assist. - PNQ		
- 120 M/month		20,400
216 M/month	<u> </u>	<u> </u>
Sub-total a	257,790	66,540
b) Travelling Expenses		
12 trips Brazil-Mozambique		
- Brazil	22,200	
12 trips in Brazil	1,800	
12 trips in Mozambique	<u> </u>	<u>3,120</u>
Sub-total b	24,000	3,120
c) Per day and Living Allowances		
01 Senior Geologist 01 - 11		
months	23,000	
01 Senior Geologist 02 - 11		
months	23,100	
01 Junior Geologist - 11 months	19,800	
02 Mining Tec. - Junior Tec. -		
20 months	<u>36,000</u>	
53 months		
Sub-total c	102,000	

	US\$	
	EXTERNAL	INTERNAL
d) Depreciation of vehicles and Equipments	<u>5,873</u>	<u>9,815</u>
Sub-total d	5,873	9,815
e) Other Expenses		
Laboratory and analytical costs	6,970	
International freights and Insurances	70,904	
Transportation in Mozambique		20,000
Auxiliary Field and Office Materials	<u>8,172</u>	<u>10,000</u>
Sub-total e	86,046	30,000
f) Indirect Costs and Profit		
(a + c). 0,20 + (b+e).0,10	<u>82,963</u>	<u>16,620</u>
Total	558,672	126,095

B.II.1!b - Drilling Program

This activity involves the following costs:

- . All expenditures with personnel, i.e, direct and indirect wages, social, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport;

Group: 01 (one) Senior Geologist 01 (Group leader)
 01 (one) Junior Geologist
 01 (one) Pusher - Senior Technician
 12 (twelve) Drillers-Junior Tec. 01
 06 (six) Drilling Assistants-Junior Tec. 02
 02 (two) Operators/Drivers-Junior Tec. 02
 02 (two) Mechanics - Junior Tec. 01
 02 (two) Administrative Assistants - Technical support
 Mozambiquean Personnel
 06 (six) Drilling Assistants
 04 (four) Drivers
 30 (thirty) Specialized Assistants

- . All expenditures consequent upon the contracting of the support personnel in Mozambique required for these services;
- . All expenditures (including insurance) incurred in the transfer (both ways) of drill rigs, and all other equipment and materials to be used in drilling, namely: drill pipes, samplers, diamond bits, casing pipes, bits, water pumps, spare parts, etc.
 With the exception of the drill rigs and their components all the equipment will remain in Mozambique after conclusion of the services;
- . All costs consequent upon the execution of the services, both in the field and in the offices mentioned in A.3.1.b.

. All expenditures with communications needed for this item.

. Detailed: Budget

	EXTERNAL	US\$	INTERNAL
a) Wages and Social Costs			
a.1) Brazilians			
01 Senior Geologist 01			
14 M/month	75,180		
01 Junior Geologist-14			
M/month	45,080		
01 Pusher-Senior Tec			
14 M/month	60,116		
12 Drillers-Junior Tec.01			
168 M/month	540,960		
06 Drilling Assistants-			
Jr.Tec. 84 M/month	210,000		
02 Operators/Drivers Jr.			
Tec 02-28 M/month	70,000		
02 Mechanics - Jr. Tec.			
01 - 28 M/month	90,160		
02 Administrative As.28			
M/month	60,116		
	378M/month		
a.2) Mozambiqueans			
06 Drilling Assistants-PQ			
72 M/month			40,680
04 Drivers-M- 52 M/month			17,680
30 Field Assistants - PNQ			
390 M/month			
	514 M/month		<u>66,300</u>
	Sub-total a	<u>1,151,612</u>	<u>124,660</u>
b) Travelling Expenses			
55 trips Brazil-Mozambique			
Brazil	101,750		

	EXTERNAL	US\$	INTERNAL
100 trips in Mozambique			<u>30,000</u>
Sub-total b	101,750		30,000
c) Per Day and Living Allowances			
01 Senior Geologist 01 - 13 months	27,300		
01 Junior Geologist - 13 months	23,400		
01 Pusher-Senior Tec. 13 months	23,400		
12 Drillers-Junior Tec. 01-156 months	280,800		
06 Drilling Assist.-Junior Tec. 02 - 78 months	109,200		
02 Operators/Drivers/Jr. Tec. 02 - 26 months	36,400		
02 Mechanics-Jr. Tec. 01 -26 months	46,800		
02 Administrative Assist. Tec. Support - 20 months	<u>28,000</u>		
345 months			
Sub-total c	575,300		
d) Depreciation			
Equipments	153,944		
Vehicles	<u>21,691</u>		<u>58,362</u>
Sub-total d	175,635		58,362
e) Materials			
Drill pipes, core barrels and casing	475,808		
Diamond Drilling bits and reaming shells	225,710		
Accessories and Spare parts	<u>247,015</u>		
Sub-total e	948,533		

	US\$	
	EXTERNAL	INTERNAL
f) Consumables	79,725	228,000
g) Services		
Maritime Freights	100,500	
Air Freights	30,120	
Insurances	16,543	
Domestic Freights		<u>190,000</u>
Sub-total g	147,163	190,00
h) Indirect Costs and Profit		
(a+c). 0,2 + (b+e+f+g).0,10	<u>473,099</u>	<u>69,732</u>
Total	3,652,817	700.754

B.II.1.c - Geophysical Profiling

- . All expenditures on personnel, i.e., direct and indirect wages, social, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.
- . Group: 01 (one) Senior Geologist 01
 02 (two) Specialized Assistants - Jr. Tec.01
 02 (two) Draftsmen - Technical Support
 Mozambiquean Personnel
 02 (two) Specialized Assistants
- . All expenditures consequent upon the contracting of support personnel required for the execution of these services;
- . All expenditures (including insurance) incurred in the transfer (both ways) of necessary equipment and materials;
- . All costs consequent upon the carrying out of the services as mentioned in A.3.I.c
- . All expenditures with communications, as utilized under this item.

Detailed Budget	US\$	
	EXTERNAL	INTERANL
a) Wages an Social Costs		
a.1) Brazilians		
01 Senior Geophysist		
01 - 12 M/month	64,400	
02 Specialized Assist.		
Jr. Tec. 01 - 24 M/		
month	77,280	
02 Draftsmen - Tec.		
Support- 22 M/month	47,234	
58 M/month		

	US\$	
	EXTERNAL	INTERNAL
a.2) Mozambiqueans		
02 Specialized Assistants		
PQ - 22 M/month	<u> </u>	<u>12,340</u>
Sub-total a	188,914	12,340
b) Travelling Expenses		
6 Trips Brazil - Mozambique -		
Brazil	11,100	
6 Trips in Mozambique	<u> </u>	<u>1,560</u>
Sub-total b	11,100	1,560
c) Per Day and Living Allowances		
01 Senior Geologist 11 months	23,100	
02 Specialized - Assist. Jr.		
Tec. 01 - 22 months	<u>39,600</u>	
33 M/months		
Sub-total c	62,700	
d) Depreciation of equipments		
and vehicles	<u>82,624</u>	
Sub-total d	82,624	
e) Air freights	5,020	2,000
f) Insurances	3,159	
g) Consumables and Spare Parts	5,000	3,000
h) Indirect Costs and Profit		
(a+c).0.20 + (b+e+f+g).0.10	<u>52,750</u>	<u>1,899</u>
Total	411,267	20,889

B.II.1.d - Chemical Analyses and Tests

- . All costs consequent upon the experiments, tests and analyses to be carried out as mentioned in A.3.1.d;
- . All expenditure with communications needed for this item;
- . Detailed Budget:

	US\$
	EXTERNAL INTERNAL
01. Preparation and Sink and Float tests (1,670 x 7 play x US\$ 13.00)	151,970
02. Proximate analysis (6.880 x US\$ 11.00)	75,680
03. Ultimate Analysis (40 x US\$.. US\$ 32.00)	1,280
04. Sulfur Determination (6,680 x US\$ 7.00)	46,760
05. Gross Calorific value (US\$.. US\$ 14.50) and Specific Gravi ty (US\$ 3.50) 3,340 x US\$.... US\$ 18.00	60,120
06. Ash analysis - major and minor elements 334 x US\$ 48.00	16,032
07. Ash fusibility (334 x US\$... US\$ 14.00)	4,676
08. Hardgrove grindability (334 x US\$ 14.70)	4,909
09. FSI (6.680 x 3.70	24,716
10. 1000 (500 of each) Audibert Ar nu dialatometry (US\$ 105.00) and Gieseler plastometry (US\$.. US\$ 17.00) (1000 x US\$ 122.00)	122,000
11. 80 (40 of each) maceral analysis (US\$ 28.00) and vitrinite reflectance (US\$... US\$21.00) (80 x US\$ 49.000)	3,920

	EXTERNAL	US\$ INTERNAL
12. 6 washability and floatation tests (6 x US\$ 5.800.00)	34,800	
13. 50 Geomechanical tests (50 x US\$ 210.00)	10,500	
14. Coke oven tests (12 x US\$.. US\$ 600.00)	7,200	
15. Indirect costs and profit (1+2....+13+14) x 0,10	<u>56,456</u>	
TOTAL	621,019	

B.II.1.e - Detailed Topographic Survey

- . All expenditures with personnel, i.e., direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging, support, as well as all transport expenditures, including international transport.
- . Group: 01 (one) Senior Cartographic Engineer 01
 06 (six) Senior Topographers
 03 (three) Draftsmen- Junior Tec. 01
 Mozambiquean Personnel
 30 (thirty) Non Specialized Workers - PNEQ
- . All expenditures (including insurance) incurred in the transfer (both ways) of all equipment and material, including the infrastructure for implementation of services;
- . All costs consequent to the services as described in A.3.1.e.
- . All expenditures with communications needed for this item.

. Detailed Budget

	US\$
	EXTERNAL INTERNAL
a) Wages and Social Costs	
a.1) Brazilians	
1 Senior Cartographer	
12 M/month	64,440
6 Senior Topographers	
72 M/month	309,168
3 Draftsmen Jr. Tec.01	
36 M/month	115,920

120M/month

	US\$	
	EXTERNAL	INTERNAL
a.2) Mozambiqueans		
6 Specialized Assist.PQ		
-60 M/month		33,900
20 Field Assist. PNQ.		
200 M/month		34,000
260 M/month		
Sub-total a	489,528	67,900
b) Travelling Expenses		
14 Trips Brazil - Mozambique		
Brazil	25,900	
14 Trips in Mozambique		3,640
Sub-total b	25,900	3,640
c) Per Day and Living Allowances		
1 Senior Cartographer		
10 months	21,000	
6 Senior Topographers		
60 months	108,000	
70 months		
Sub-total c	129,000	
d) Depreciation		
Equipments	32,776	
Vehicles	14,094	
Sub-total d	46,870	
e) Materials and Consumables	14,996	10,000
f) Air Freights	15,060	20,000
Insurances	2,286	
Sub-total f	17,346	20,000
g) Indirect Costs and Profit		
(a+c) x 0,20 + (b+e+g)x0,10	129,529	16,944
Total	853,169	118,484

B.II.1.f - Data Compilation, Sampling and Data Processing

- . All expenditures with personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.
- . Group: 01 (one) Senior Geologist 01
 04 (four) Junior Geologists 01
 03 (three) Mining Tec. Jr. Tec. 01
 03 (three) Draftsmen Jr. Tec. 02
 Mozambican Personnel
 15 (fifteen) Field Assistants - PNQ
- . All expenditures consequent upon the contracting of the support personnel in Mozambique required for these services;
- . All costs consequent upon the carrying out of the services as mentioned in A.3.1.f;
- . All costs incurred in reprography and printing;
- . All expenditures with communications needed for this item.

Detailed Budget	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
a.1) Brazilians		
1 Senior Geologist 01		
12 M/month	64,440	
4 Junior Geologist 01		
44 M/month	141,680	
3 Mining Tec. Jr. Tec.01		
30 M/month	96,600	
3 Draftsmen - Jr.Tec. 02		
36 M/month	90,000	
	122 M/month	

	US\$	
	EXTERNAL	INTERNAL
a.2) Mozambiqueans		
15 Field Assist. PNQ		
150 M/month	<u> </u>	<u>25,500</u>
Sub-total a	392,720	25,500
b) Travelling Expenses		
16 Trips Brazil-Mozambique-Brazil	29,600	
20 Trips in Mozambique	<u> </u>	<u>5,200</u>
Sub-total b	29,600	5,200
c) Per Day and Living Allowances		
1 Senior Geologist 01		
10 months	21,000	
4 Junior Geologists 01		
40 months	72,000	
3 Mining Tec. - Jr.Tec. 01		
27 months	<u>48,600</u>	
77 months		
Sub-total c	141,600	
d) Data Processing and Computer Rental	75,500	
e) Other miscellaneous expenses, communications, consumables, printing and copies	5,000	10,000
f) Indirect Costs and Profit		
(a+c) x 0,20 + (b+e) x 0,10	<u>110,324</u>	<u>6,620</u>
Total	754,744	47,320

B.II.1.g - General Coordination, Consulting and Final Report

- . All expenditures with personnel, i.e., direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.
- . Group: General Coordination
 - 02 (two) Coordinators (one in Brazil and one in Mozambique)
 - 02 (two) Consultants
 - Final Report
 - 02 (two) Senior Engineers 01
 - 01 (one) Senior Geologist 01
 - 02 (two) Draftsmen - Jr. Tec. 01
 - 02 (two) Typewriters - Tec. Support
- . All expenditures incurred in reprography, binding and printing costs in general;
- . All expenditures with communications needed for this item;
- . Detailed Budget

	US\$
	EXTERNAL INTERNAL
a) Wages and Social Costs	
02 Coordinators - 28 M/month	168,000
02 Consultants - 8 M/month	48,000
01 Senior Engineer 01	
4 M/month	21,480
01 Senior Geologist 01	
4 M/month	21,480
02 Draftsmen - Jr. Tec. 01	25,760
02 Typewriters- Tec. Support	
8 M/month	17,176
60 M/month	
Sub-total a	301,896

	EXTERNAL	US\$	INTERNAL
b) Travelling Expenses			
14 Trips Brazil-Mozambique			
- Brazil	25,900		
14 Trips in Mozambique	<u> </u>		<u>3,640</u>
Sub-total b	25,900		3,640
c) Per Day and Living Allowances			
01 Coordinator (Br) - 80 days	12,000		
02 Consultants (Br) - 60 days	9,000		
01 Coordinator (Mo) - 14 days	<u>29,400</u>		
140 days/14 months			
Sub-total c	50,400		
d) Others expenses			
Communications - Telex and			
Telephone - US\$ 800.00/per			
month	11,200		
Copies, reprography, office			
consumables	<u>4,000</u>		
Sub-total d	15,200		
e) Final Report - Printing			
Binding, photographic			
services, reproduction of			
maps profiles etc...	15,000		
f) Indirect Costs and Profit			
(a+c) 0,20 + (b+d+e) 0,10	<u>76,069</u>		<u>364</u>
Total	484,465		4,004

B.II.2 BASIC ENGINEERING DESIGN
FOR THE MUCANHA/VUZI COAL
OUTFLOW TRANSPORTATION
PROJECT - COST ESTIMATES -

B.II.2.a Basic Project for the Railway Section Between Mucanha/Vuzi and Cambulatsisse and the Cateme Variant.

- . All expenditures with personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport;
- . All expenditures consequent upon the contracting of the support personnel in Mozambique required for these services;
- . All expenditures (including insurance) incurred in the transfer (both ways) of equipment and materials;
- . All costs consequent upon the carrying out of the services;
- . All expenditures with communications needed for this item;
- . Team:
 - 01 (one) Engineer (Leader of the railway project)
 - 02 (two) Engineers (Specialized Consultants)
 - 11 (eleven) Senior Engineers 01 (Group leader)
 - 01 (one) Senior Geologist 01 (Group leader)
 - 02 (two) Senior Geologist 02 (Group member)
 - 05 (five) Senior Engineers 02 (Group leader)
 - 01 (one) Senior Architect 02 (Group leader)
 - 11 (eleven) Senior Engineers 02 (Group member)
 - 06 (six) Junior Engineers (Group member)
 - 08 (eight) Technical Assistant (Senior)
 - 13 (thirteen) Technical Assistants (Juniors)
 - 01 (one) Senior Draftsman
 - 18 (eighteen) Draftsmen (Junior)
 - 06 (six) Copy-draftsmen
 - 01 (one) Secretary
 - 02 (two) Typewriters

Mozambiquean Personnel

01 Senior Engineer 02 (Resident in Tete)
 01 (one) Junior Engineer (Resident in Tete)
 01 (one) Administrative Manager (Head of Maputo office)
 01 (one) Administrative Manager (Head of Tete office)
 02 (two) Senior Topographers
 02 (two) Junior Geotechnicians
 01 (one) Secretary (Maputo office)
 01 (one) Secretary (Tete office)
 01 (one) Manager (Tete office)
 03 (three) Drivers (Tete office)
 01 Driver (Maputo office)

Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
a.1) Brazilians		
Consultants and Coordinator		
23.50 Men x month	141,000	
Engineers and Senior 01		
Geologist 41.00 Men x month	220,170	
Engineers and Senior 02		
Architect 90.25 Men x month	433,200	
Junior Engineers		
41.00 Men x month	132,020	
Senior Technicians		
66.00 Men x month	283,404	
Junior Technicians 01		
43.75 Men x month	140,875	
Junior Technicians 02		
80.50 Men x month	281,250	

	US\$	
	EXTERNAL	INTERNAL
Tec. Support		
54.00 Men x month	115,938	
Adm. Support		
40.00 Men x month	85,880	
Total 480.00 Men x month		
a.2) Mozambiqueans		
Adm. Support - 15 Men x month		16,950
Secretary Typist - 45 Men x month		27,825
Drivers - 60 Men x month		<u>18,000</u>
Sub-Total a)	<u>1,753,737</u>	62,775
b) Travelling Expenses		
39 trips Brazil-Mozambique-Brazil	72,150	
38 trips in Mozambique		<u>9,880</u>
Sub-Total b)	72,150	9,880
c) Per day and living allowances		
600 per day allowances	90,000	
90 monthly living allowances	<u>146,000</u>	
Sub-Total c)	236,000	
d) Installations		
Camp and office setting	25,000	4,000
Furniture and equipments	40,000	
Vehicles	60,000	
Fuel and lubricants		48,000
Communications	30,000	
Sea transportation	5,300	

	US\$	
	EXTERNAL	INTERNAL
Printing and copies	36,000	
Computer rental	30,000	
Consumption Supplies	20,000	10,000
Topographic and aerophotogrametric services	2,563,783	
Geotechnical services	<u>1,600,000</u>	<u> </u>
Sub-Total d)	4,404,783	62,000
e) Indirect Costs and Profit		
(a+c) x 0.20 + (b+d) x 0.10	<u>845,640</u>	<u>19,743</u>
TOTAL	7,312,310	154,398
GRAN TOTAL	<u>7,466,708</u>	

B.II.2.b Basic Project for Terminals and Access Routes

- Beira Terminal

- . All expenditures with personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging, support, as well as all transport expenditures, including international transport.
- . All expenditures (including insurance) incurred in the transfer (both ways) of all equipment and material, including the infrastructure for implementation of services.
- . All costs consequent upon the carrying out of services before mentioned both in the field and in the office.
- . All expenditures with communications needed for this item.

Group:

- 01 (one) Senior 01 Engineer - Technical Coordinator
- 01 (one) Senior 01 Engineer - Consultant
- 06 (six) Civil, Structural, Mechanical, Electrical, Installation's Engineers and Architect. All Senior 02.
- 06 (six) Structural, Civil, Mechanical, Installation's, Electrical, Engineers and Architect. All Juniors.
- 01 (one) Senior Hydrograph Technician
- 01 (one) Senior Surveyor
- 03 (three) Senior Project Technicians
- 03 (three) Junior 01 Project Technicians
- 03 (three) Junior 02 Project Draftsmen
- 01 (one) Junior 02 Surveyor

Detailed Budget

		US\$	
		EXTERNAL	INTERNAL
a)	Wages and Social Costs		
	a.1) Brazilian Personnel		
	Project Coordinator-07 Men x Month	42,000	
	Senior 01 Engineer (specialized consultants) - 2.5 Men x Month	15,000	
	Senior 01 Engineer-17.5 Men x Month	93,975	
	Senior 02 Engineer-14.5 Men x Month	69,600	
	Junior Engineer - 22.0 Men x Month	70,840	
	Senior Technical Assistants 22.0 Men x month	94,468	
	Junior Technical Assistants 19,0 Men x Month	61,180	
	Junior 02 Technical Assistants 15.0 Men x Month	37,500	
	a.2) Mozambiquean Personnel		
	16 (sixteen) non-specialized personnel		<u>2,720</u>
	Sub-Total a)	484,563	2,720
b)	Travelling Expenses		
	20 round-trips Brazil-Mozambique	36,300	
	15 trips in Mozambique		<u>3,900</u>
	Sub-Total b)	36,300	3,900
c)	Per Day and Living Allowances		
	350 per day allowances	45,000	
	Living allowances	<u>12,000</u>	
	Sub-Total c)	57,000	

	US\$	
	EXTERNAL	INTERNAL
d) Other Expenses		
Vehicles	4,000	
Print and copies	8,000	
Computer rental	6,000	
Equipment rental	10,000	
Sea Transportation (equip.)	5,000	
Photographic Services	1,000	
Communications	2,500	
Geological Services	140,000	
Topographic Services	20,000	
Others	10,000	
	<hr/>	
Sub-Total d)	206,500	
e) Indirect Costs and Profits		
(a+c) x 0.20 + (b+d) x 0.10	132,593	934
	<hr/>	<hr/>
TOTAL	916,956	7,554
		<hr/>
GRAN TOTAL		924,510

B.II.2.c General Coordination, Assistance and Supervision of the Transport Projects (Basic Estimations)

- . All expenditures with personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures international transport.
- . All expenditures consequent upon the contracting of the support personnel in Mozambique required for these services.
- . All costs consequent upon the carrying out of the services.
- . All expenditures with communications needed for this item.

. Group:

- 01 (one) Senior 01 General Coordinator
- 02 (two) Senior 01 Railway Engineer
- 02 (two) Senior 02 Port Engineer
- 03 (three) Technical and Administrative Assistants

. Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
- Senior 01 General Coordinator 18 Men x Month	108,000	
- Senior 01 - 25 Men x Month	134,250	
- Techn. and adm. Support (44 Men x Month)	<u>94,468</u>	
Sub-Total	a) 336,718	

b) Travelling Expenses

	US\$	
	EXTERNAL	INTERNAL
25 (twenty-five) trips Brazil- Mozambique - Brazil	46,250	
20 (twenty) trips in Mozambique	<u> </u>	<u>5,200</u>
Sub-Total b)	46,250	5,200
c) Per Day Allowances		
510 per day allowances	<u>76,500</u>	
Sub-Total c)	76,500	
d) Other Expenses		
Car rental	4,000	
Printing and copies	3,000	
Communications	<u>14,000</u>	
Sub-Total d)	21,000	
e) Indirect Costs and Profit		
0.2 (a+c) + 0.1 (b+d)	<u>89,369</u>	<u>520</u>
TOTAL	569,837	5,720
GRAN TOTAL	<u>575,557</u>	

B.II.2.d Review of the Costs and Financial Aspects.

- . All expenditures with personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.
- . All expenditures consequent upon the contracting of the support personnel in Mozambique required for these services.
- . All costs consequent upon the carrying out of the services.
- . All expenditures with communications needed for this item.

. Group:

- 01 (one) Senior 01 (Group Chief)
- 01 (one) Economist
- 01 (one) Senior 01 Transportation Engineer
- 01 (one) Senior 02 Transportation Engineer
- 06 (six) Junior Engineers
- 01 (one) Secretary

. Detailed Budget

	US\$
	EXTERNAL INTERNAL
a) Wages and Social Costs	
<u>Brazilians</u>	
Group Chief - 4 Men x Month	24,000
Senior 01 Economist - 3 Men x Month	16,110
Senior 01 Engineer - 3 Men x Month	16,110
Senior 02 Engineer - 3 Men x Month	14,400
Junior Engineers - 6 Men x Month	19,320
Administrative Support-3 Men x Month	<u>6,441</u>
Sub-Total a)	96,381
22 Men x Month	

	US\$	
	EXTERNAL	INTERNAL
b) Travelling Expenses		
10 (ten) trips Brazil-Mo- zambique - Brazil	18,500	
09 (ninc) trips in Mozambique	<u> </u>	<u>2,340</u>
Sub-Total b)	18,500	2,340
c) Per day Allowances		
70 per day allowances	<u>10,500</u>	
Sub-Total c)	10,500	
d) Other Expenditures		
Car rental	2,000	
Printing and Copies	5,000	
Computer rental	20,000	
Communications	<u>5,000</u>	
Sub-Total d)	32,000	
e) Indirect costs and profits		
0.2 (a+c) + 0.1 (b+d)	<u>26,796</u>	<u>234</u>
TOTAL	187,877	2,574
GRAN TOTAL	<u>190,451</u>	

B.II.2.e *Training Program of Human Resources in Transportation.*

- . All expenditures with personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.
- . All expenditures consequent upon the contracting of the support personnel in Mozambique required for these services.
- . All costs consequent upon the carrying out of the services.
- . All expenditures with communications needed for this item.

. Group:

- 01 (one) Senior 01 Leader (Group Leader)
- 04 (four) Senior 02 - Assistant
- 01 (one) Secretary - typist.

. Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
Senior 01 Leader - 4 Men x Month	24,000	
Senior 02 (Group member) - 8 Men x Month	38,400	
Secretary - 4 Men x Month	<u>8,588</u>	
Sub-Total	a) 70,988	
b) Travelling Expenses		
4 (four) trip Brazil-Mozambique - Brazil	7,400	
3 (three) trips in Mozambique	<u> </u>	<u>780</u>
Sub-Total	b) 7,400	780

	US\$	
	EXTERNAL	INTERNAL
c) Per Day Allowance		
60 (sixty) per day allowances	<u>9,000</u>	
Sub-Total	c) 9,000	
d) Other Expenses		
Printing and Copies	8,000	
Communications	<u>7,500</u>	
Sub-Total	d) 15,500	
e) Indirect Costs and Profits		
0.20 (a+c) + 0.10 x (b+d)	<u>18,287</u>	<u>78</u>
TOTAL	121,175	858
GRAN TOTAL	<u>122,033</u>	

*B.II.3 MINE BASIC PROJECT, COAL
PREPARATION PLANTS AND
AUXILIARY FACILITIES -
ECONOMICAL AND FINANCIAL
FEASIBILITY STUDY*

B.II.3.a General Coordination

All expenditures on personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.

Group: 01 (one) Senior 1 Coordinator Engineer
 01 (one) Junior Engineer
 Support Personnel

. All costs consequent upon the carrying out of services, as mentioned in item A.3.3.a.

. All expenditures with communications needed for this item.

. Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
01 (one) Coordinator Engineer		
Senior 1 - 24 M/month	144,000	
01 (one) Junior Engineer		
3 M/month	9,660	
Support Personnel - 24 M/month	<u>51,528</u>	
Sub-Total - 51 M/month	205,188	
b) Travel Expenses		
06 (six) round-trips Brazil -		
Mozambique	11,100	
06 (six) trips in Mozambique		1,800
c) Per Day Allowances		
80 (eighty) at US\$ 150	12,000	

	US\$	
	EXTERNAL	INTERNAL
d) Other Expenses		
Communication	6,000	
Copies and Binding	8,000	
Internal Trips in Brazil	<u>4,000</u>	
Sub-Total	18,000	
e) Indirect Costs and Profit		
(a + c).0,20 + (b + d). 0,10	<u>46,347</u>	<u>180</u>
TOTAL	292,635	1,980

B.II.3.b Mining Project

All expenditures on personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well transport expenditures, including international transport.

Group: 01 (one) Senior 1 Engineer
 01 (one) Consultant
 01 (one) Junior Engineer
 01 (one) Senior Designer
 01 (one) Junior Designer
 01 (one) Draftsman - Designer

. All costs consequent upon the carrying out of services, as mentioned in item A.3.3.b.

. All expenditures with communications needed for this item.

. Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
01 (one) Senior 1 Engineer - 7 M/month	37,590	
01 (one) Consultant - 7 M/month	37,590	
01 (one) Junior Engineer - 6 M/month	19,320	
01 (one) Senior Designer - 2 M/month	8,588	
01 (one) Junior Designer - 3,5 M/month	11,270	
01 (one) Draftsman Designer - 2 M/month	<u>5,000</u>	
Sub-Total - 27,5 M/month	119,358	
b) Travel Expenses		
03 (three) round-trips Brazil-Mozambique	5,550	
03 (three) internal trips in Mozambique		900

	US\$	
	EXTERNAL:	INTERNAL
c) Per Day Allowances		
40 (forty) at US\$ 150	6,000	4,000
d) Other Expenses		
Communications	3,000	
Copies, bindings	4,000	
Internal Trips in Brazil	<u>2,000</u>	
Sub-Total d	9,000	
e) Indirect Costs and Profit		
(a+c).0,20 + (b+d).0,10.	<u>26,526</u>	<u>90</u>
TOTAL	166,434	990

B.II.3.c Coal Preparation Project

All expenditures on personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.

Group: 01 (one) Senior 1 Engineer
 01 (one) Consultant
 01 (one) Junior Engineer
 01 (one) Drafstman Designer
 01 (one) Drafstman

- . All costs consequent upont the carrying out of services, as mentioned in item A.3.3.c.
- . All expenditures with communications needed for this item.
- . Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Costs		
01 (one) Senior 1 Engineer - 8 M/month	42,960	
01 (one) Consultant - 8 M/month	42,960	
01 (one) Junior Engineer - 3 M/month	9,660	
01 (one) Drafstman Designer - 2 M/month	5,000	
01 (one) Drafstman - 1 M/month	<u>2,147</u>	
Sub-Total - 22 M/month	102,727	

	US\$	
	EXTERNAL	INTERNAL
b) Travel Expenses		
03 (three) round-trips Brazil - Mozambique	5,550	
03 (three) Internal trips in Mozambique		900
c) Per Day Allowances		
40 (forty) at US\$ 150	6,000	
d) Other Expenses		
Communications	3,000	
Copies, bindings	4,000	
Internal Trips in Brazil	<u>2,000</u>	
Sub-Total	9,000	
e) Pilot Plant Testing (Sub-Contracted by Others)	100,000	
f) Indirect Costs and Profit (a+c).0,20 + (b+d+e).0,10	<u>33,200</u>	<u>90</u>
TOTAL	256,477	990

B.II.3.d Layouts of the Coal preparation and Auxiliary Facilities and Miners Village Project

All expenditures on personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.

Group: 02 (two) Senior 2 Mechanical Engineers
 02 (two) Senior 2 Architects
 01 (one) Senior 2 Civil Engineer
 03 (three) Senior Designers
 03 (three) Junior Designers
 03 (three) Drafstman

- . All costs consequent upon the carrying out of services, as mentioned in item A.3.3.d.
- . All expenditures with communications needed for this item.
- . Detailed Budget

	US\$
	EXTERNAL INTERNAL
a) Wages and Social Costs	
02 (two) Senior 2 Mechanical Engineers - 10 M/month	48,000
02 (two) Senior 2 Architects 9 M/month	43,200
01 (one) Senior 2 Civil Engineer 9 M/month	43,200
03 (three) Senior Designers 7 M/month	30,058
03 (three) Junior Designers 13 M/month	41,860
03 (three) Drafstmen - 12 M/month	<u>25,764</u>
Sub-Total - 60 M/month	232,082

	US\$	
	EXTERNAL	INTERNAL
b) Travel Expenses		
06 (six) round-trips Brazil - Mozambique	11,100	
06 (six) internal trips		1,800
c) Per Day Allowances		
80 (eighty) at US\$ 150	12,000	
d) Other Expenses		
Communications	6,000	
Copies, bindings	8,000	
Internal trips in Brazil	<u>4,000</u>	
Sub-Total	18,000	
e) Field Services required (Sub-Contracted by Others)		
SPT drilling at the installations area (50 drills - 750 m) US\$ 150/m	112,500	
Topographic survey, including field survey in the Project area (1 Km ² ; 1/1000; 1 m contours	<u>30,000</u>	
Sub-Total	142,500	
f) Indirect Costs and Profit		
(a+c).0,20 + (b+d+e).0,10	<u>65,976</u>	<u>180</u>
TOTAL	481,658	1,980

B.II.3.e Utilities, Instrumentation, Electric Power, Piping and Roadway

All expenditures on personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.

Group: 06 (six) Senior 1 Engineers
 01 (one) Consultant
 02 (two) Senior 2 Engineers
 03 (three) Senior Designers
 02 (two) Junior Designers
 01 (one) Draftsman Designer
 02 (two) Draftsmen

- . All costs consequent upon the carrying out of services, as mentioned in item A.3.3.e.
- . All expenditures with communications needed for this item.
- . Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
a) Wages and Social Cost		
06 (six) Senior 1 Engineers - 12,5 M/month	67,125	
01 (one) Consultant - 6 M/month	36,000	
02 (two) Senior 2 Engineers - 8 M/month	38,400	
03 (three) Senior Designers - 8 M/month	34,352	
02 (two) Junior Designers - 7 M/month	22,540	
01 (one) Draftsman Designer - 8 M/months	20,000	
02 (two) Draftsmen - 2 M/months	<u>4,294</u>	
Sub-Total - 51,5 M/months	222,711	

	US\$	
	EXTERNAL	INTERNAL
b) Travel Expenses		
06 (six) round-trips Brazil-Mozambique	11,100	
06 (six) internal trips in Mozambique		1,800
c) Per day Allowances		
80 (eighty) per day allowances US\$ 150	12,000	
d) Other Expenses		
Communications	6,000	
Copies, bindings	8,000	
Internal trips in Brazil	<u>4,000</u>	
Sub-Total	18,000	
e) Field Services required (by others)		
Aerial-Photographic restitution, including field support at access road implantation area (70 Km; SC:1/5,000)	100,000	
Aerial-photographic restitution including field support at power line implantation area (130 Km; SC:1/5,000)	<u>260,000</u>	
Sub-Total	360,000	
f) Indirect Cost and Profit		
(a+c).0.20 + (b+d+e).0.10	<u>85,852</u>	<u>180</u>
TOTAL	709,663	1,980

B.II.3.f Market Study, Budget, Economical, Financial and Social Feasibility Study

All expenditures on personnel, i.e. direct and indirect wages, social security and legal liabilities, travel expenses and all expenditures incurred in lodging and support, as well as all transport expenditures, including international transport.

Group: 01 (one) Senior 1 Economist
 01 (one) Consultant
 01 (one) Junior Economist
 01 (one) Senior Budgetary Technician
 02 (two) Senior 2 Engineers
 01 (one) Senior 1 Engineer/Economist
 01 (one) Junior Engineer/Economist
 Support Personnel

- . All costs consequent upon the carrying out of services, as mentioned in item A.3.3.f.
- . All expenditures with communications needed for this item.
- . Detailed Budget

	US\$
	EXTERNAL INTERNAL
a) Wages and Social Costs	
01 (one) Senior 1 Economist 6 M/month	32,220
02 (two) Consultants - 6 M/month	36,000
01 (one) Junior Economist - 3 M/month	9,660
01 (one) Senior Budgetary Technician 3 M/month	12,882
02 (two) Senior 2 Engineers 4 M/month	19,200
01 (one) Junior Budgetary Technician 3,5 M/month	11,270

	US\$	
	EXTERNAL	INTERNAL
01 (one) Senior 1 Engineer/Economist 3,5 M/month	18,795	
01 Junior Engineer/Economist 1,5 M/month	4,830	
Support Personnel - 3 M/month	<u>6,441</u>	
Sub-Total	151,298	
b) Travel Expenses		
06 (six) round-trips Brazil - Mozambique	11,100	
06 (six) internal trips in Mozambique		1,800
c) Per day Allowance		
140 (one hundred and forty) at US\$150	21,000	
d) Other Expenses		
Communications	6,000	
Copies, bindings	4,000	
Internal Trips in Brazil	<u>2,000</u>	
Sub-Total	12,000	
e) Indirect Costs and Profits		
(a+c).0,20 + (b+d).0,10	<u>36,796</u>	<u>180</u>
TOTAL	232,167	1,980

*B. II. 4 STUDIES OF ALTERNATIVES
FOR INTEGRATED REGIONAL
DEVELOPMENT AND LAND
OCCUPATION, MIDDLE
ZAMBEZE*

*B.II.4 STUDIES OF ALTERNATIVES FOR INTEGRATED REGIONAL DEVELOPMENT
AND LAND OCCUPATION. MIDDLE ZAMBEZE*

- . Studies concerning the farm exploitation of the zone of influence of the Mucanha-Vuzi railroad.
- . All personnel costs, i.e. direct and indirect wages, social charges, social security and legal liabilities, travel allowances, all lodging and living costs, as well as all transport expenses, including international travel;
- . All expenses from the hiring of support personnel in Mozambique, such as drivers and assistants;
- . All expenses (including insurance costs) with the conveyance (going and coming) of required equipment and material;
- . All costs resulting from the performance of the services, both field and office;
- . All expenses with communication relative to those studies.

Group: 1 (one) Agricultural Engineer - Coordinator of studies
 2 (two) Agricultural or Soil Engineers - Senior
 2 (two) Agricultural or Soil Engineers - Junior
 1 (one) Forestry Engineer - Senior
 1 (one) Forestry Engineer - Junior
 1 (one) Veterinarian, or Animal Husbandry Expert ,
 or Biologist or Fish Farming Engineer - Senior
 1 (one) Veterinarian, or Animal Husbandry Expert, or
 Biologist - Junior
 1 (one) Engineer or Agricultural Engineer - Senior
 5 (five) Technical Assistants
 3 (tree) Draughtsmen
 1 (one) Typist-Secretary
 1 (one) Typist

Mozambiquean Personnel

4 (four) Qualified Personnel
 3 (tree) Drivers
 20 (twenty) Unqualified Personnel

Detailed Budget

	US\$	
	EXTERNAL	INTERNAL
<i>a) Wages and Social Charges</i>		
<i>a.1) Brazilians</i>		
01 Agricultural Engineers Senior Coordinator 4m x 6,000	24,000	
02 Agricultural Engineers or Edapho- logists SR1 4m x 5,370	42,960	
02 Agricultural Engineers or Edapho- logists Jr 4m x 3,220	25,760	
01 Forestry Engineer SR1 4m x 5,370	21,480	
01 Forestry Engineer Jr 4m x 3,220	12,880	
01 Veterinarian, or Animal Hus- bandry Expert, or Biologist, or Fish Farming Engineer-SR1 4m x 5,370	21,480	
01 Engineer or Agricultural Engineer SR1 2m x 5,370	10,740	
01 Veterinarian, or Animal Hus- bandry Expert, or Biologist, or Fish Farming Engineer - Jr 4m x 3,220	12,880	
05 Technical Assistants 3m x 2,147	32,205	
03 Draughtsmen 2m x 2,147	12,882	
01 Typist Secretary 4m x 1,500	6,000	
02 Typist 1m x 1,000	2,000	

	US\$	
	EXTERNAL	INTERNAL
<i>a. 2) Mozambiqueans</i>		
04 Qualified Personnel		
2m x 565		4,520
20 Unqualified Personnel		
2m x 170		6,800
03 Drivers 2m x 340		2,040
Sub total <u>a</u>	225,267	13,360
 <i>b) Travel Costs</i>		
Travel Costs: Brazil-Mozambique-		
Brazil	20,350	
Travel Costs in Mozambique		2,860
Sub total <u>b</u>	20,350	2,860
 <i>c) Per day Allowance and Living Allowance</i>		
01 Coordinator Sr		
30 + Living Allowance	6,600	
02 Agricultural Engineers or Edapho		
logists SR1-30 + living Allowance	13,200	
02 Agricultural Engineers or Edapho		
logists JR-30 + Living Allowance	10,200	
01 Forestry Engineer SR1		
30 + Living Allowance	6,600	
01 Forestry Engineer JR		
30 + Living Allowance	5,100	
01 Veterinarian, or Animal Husbandry		
Expert, or Biologist, or Fish		
Farming Engineer SR1		
30 + Living Allowance	6,600	

	US\$	
	EXTERNAL	INTERNAL
01 Veterinarian, or Animal Husbandry Expert, or Biologist, or Fish Farming Engineer Jr 30 + Living Allowance	5,100	
01 Engineer or Agricultural Engineer SR1 - 30 + Living Allowance	6,600	
Sub total <u>c</u>	60,000	
<i>d) Other Expenses</i>		
03 Purchase of Vehicles	36,000	
470 Aerial Photographs		3,525
Field & Office Material	3,000	
Computer Lease	6,000	
Helicopter Lease		12,500
Telephone and Telex	1,500	1,500
Materials Transport	1,500	500
Printing Costs	2,000	
International Freight & Insurance	2,500	
Fuels & Lubricants		1,500
Miscellaneous	3,000	
Sub total <u>d</u>	55,500	19,525
<i>e) Indirect Cost and Profit</i>		
(a + c) . 0,2 + (b + d) . 01	<u>64,638</u>	<u>4,910</u>
T O T A L	<u>425,410</u> -----	<u>40,655</u> -----