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STAFF APPRAISAL REPORT

MOROCCO

JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

February 12, 1985

Industry Department

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CURRENCY EQUIVALENTS

Dirham (DH) 1 = US\$0.105

DH 9.5 = US\$1.00
(as of January 1, 1985)

FISCAL YEAR

January 1 - December 31

WEIGHTS, MEASURES, AND ENERGY CONVERSION FACTORS

1 square kilometer (sq. km.)	=	100 hectares (ha)	=	0.3861 square miles
1 metric ton (tonne, t)	=	1,000 kilograms (kg)	=	2,205 pounds (lb)
1 Mt	=	1,000,000 tons		
1 kilometer (km)	=	1,000 meters (m)	=	0.6214 miles (mi)
1 inch (in)	=	2.54 centimeters (cm)		
1 barrel (bbl)	=	42 U.S. gallons	=	159.0 liters
1 kilocalorie (kcal)	=	3.968 British thermal units (Btu)		
1 Megawatt (MW)	=	1,000 kilowatts (kW)		
1 ton of crude oil equivalent (toe)	=	2.00 tons of raw fines from Jerada anthracite mine (0.50 toe/T)		
	=	1.40 tons of washed Jerada anthracite (0.74 toe/T)		
	=	1.70 tons of imported steam coal (0.59 toe/T)		
	=	4200 kWh of electricity (245 toe/GWh) (2,500 kcal/kWh)		

PRINCIPAL ABBREVIATIONS AND ACRONYMS USED

BME	-	Belgian Mining Engineers
BRPM	-	Bureau de Recherches et de Participations Minières
CdM	-	Charbonnages du Maroc (the Borrower)
CIOR	-	Cimenterie de l'Oriental
KfW	-	Kreditanstalt für Wiederaufbau
MEM	-	Ministry of Energy and Mines
ONAREP	-	Office National de Recherches et Exploitations Pétrolières
ONE	-	Office National de l'Electricité

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This report was prepared by Messrs. K. Voltaire, S. von Klaudy and H. Hendriks, of the Industry Department on the basis of an appraisal mission in July, 1984.

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KINGDOM OF MOROCCO

JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

LOAN AND PROJECT SUMMARY

Borrower: Charbonnages du Maroc (CdM)

Guarantor: Kingdom of Morocco

Amount: US\$27.0 million equivalent

Terms: Payable in 15 years, including four years of grace at the Bank standard variable interest rate. CdM would pay a guarantee fee of 1.0% of the loan outstanding to the Government.

Project Description: The project is directed towards the modernization and expansion of the Jerada mine from 0.8 mtpy to 1.0 mtpy by 1988 and the strengthening of CdM's operational and planning capabilities. It would (i) concentrate production in a single mine (ii) simplify the infrastructure of this mine for increased productivity and production, and (iii) improve safety, health and working conditions in the mine. It includes:

- (a) a drilling program to prepare underground development work and shaft sinking;
- (b) underground development work to prepare future mining areas and to simplify existing mining areas;
- (c) sinking of an additional vertical shaft to maintain the production capacity after completion of the project and depletion of CdM's smaller mines;
- (d) installation of underground and surface equipment to increase efficiency, production capacity and to improve safety and health; and
- (e) technical assistance to support CdM in the implementation of above tasks.

Project benefits: The project would help secure and expand a competitive indigenous coal supply in Morocco. Given Morocco's chronic balance of payments deficits due to

a large extent to fuel imports, the Project is expected to have a beneficial impact in that area. An important benefit is also the strengthening of CdM to make it a financially viable and well managed company.

Project risks:

The project carries geological, technical and economic risks that are prevalent in underground thin seam coal mining. The geological risks are of two kinds: (i) lower minable reserves than estimated and (ii) difficult geological conditions linked with the shaft sinking. The exploration program is designed to remove the uncertainty related to the geological conditions. The technical risks relate to the possibility of CdM not attaining the planned production build-up. These risks are reduced because of CdM's 3 year experience with mechanized coal winning, the reinforcement of CdM's organization and a technical assistance program. The economic and financial risks relate to the long-term competitiveness of Jerada coal vis-a-vis imported coal and the financial viability of CdM. Closeness to markets and the expected increase in productivity should help CdM retain a comparative advantage in Eastern Morocco. Also an adequate coal pricing policy should help maintain CdM's financial viability in the future.

Project Cost Estimate: a/

	(US\$ million)			% Foreign Exchange	% Total Base Costs
	Local	Foreign	Total		
<u>Investment Costs</u>					
A. Civil Works	13.5	9.8	23.3	42	45
B. Equipment	3.2	23.1	26.3	88	41
C. Services	0.4	1.6	2.0	79	5
Total Investment Costs	17.1	34.5	51.6	67	100
Total Base Costs	17.1	34.5	51.6	67	100
Physical Contingencies	2.1	3.5	5.6	62	11
Price Contingencies	5.0	9.5	14.5	66	28
Total Project Costs	24.2	47.5	71.7	66	139
Increase in Working Capital	0.5	1.8	2.3	80	4
Total Financing required	24.7	49.3	74.0	67	143

a/ Including US\$2.2 million in taxes and duties.

Financing Plan:

<u>External</u>	----- (US\$ million) -----		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
IBRD	-	27.0	27.0
KfW	-	12.9	12.9
France	-	7.6	7.6
<u>Internal</u>	-	-	-
CdM	<u>24.7</u>	<u>1.8</u>	<u>26.5</u>
Total	24.7	49.3	74.0

Estimated Disbursement:

	----- (US\$ million) -----					
	IBRD Fiscal Years					
	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
Annual	2.5	4.0	7.0	7.0	5.5	1.0
Cumulative	2.5	6.5	13.5	20.5	26.0	27.0

Economic Rate of Return:

36%

Maps: IBRD 18452RI
IBRD 18453

I. INTRODUCTION

1.01 The Government of Morocco and Charbonnages du Maroc (CdM) have requested a Bank loan of about US\$27.0 million to help finance the modernization and expansion of the Jerada Coal Mine in the province of Oujda (Map 18452). The project would seek to modernize the mine and expand its capacity, from 800,000 tons per year (tpy) of anthracite coal, to 1 million tons by end 1988. The Project is part of the Moroccan Government strategy to encourage and develop use of indigenous energy resources whenever this is technically and economically viable.

1.02 The financing requirements for the project, including contingencies and escalation are estimated at US\$74.0 million equivalent, of which US\$49.3 million in foreign exchange. The proposed Bank loan would cover about 57 percent of the Project's foreign exchange cost or 38 percent of total project cost. The Project is being co-financed with the Federal Republic of Germany's Kreditanstalt für Wiederaufbau (KfW) which would provide US\$12.9 million equivalent. In addition, the French Government agreed recently to financing for a total amount of US\$7.6 million equivalent. CdM will provide all the required local financing including taxes and duties, and would cover from its own sources incremental working capital.

1.03 The Project was initially submitted for Bank consideration in September, 1981 and was prepared with the help of Belgian consultants, Belgian Mining Engineers (BME) financed by the Bank under Loan 2114-MOR. It was appraised in July 1984 by a mission comprising Messrs. Voltaire (Mission leader), Hendriks and von Klauudy, of the Industry Department.

II. THE ENERGY SECTOR

A. Background ^{1/}

2.01 For a number of years, Morocco has faced a severe and increasing shortage of domestic energy resources. From 1980 to 1983 the energy deficit as a percentage of total consumption grew from 83% to 88%. Oil imports covered most of this deficit, and although they declined in value during 1983 (approximately US\$700 million) their average for the past four years has been around US\$1 billion per year. These imports, which have averaged 45-50 percent of Morocco's yearly exports, have constituted a major element of the country's balance of payments problems.

^{1/} The Bank carried out a survey of the Energy Sector in Morocco in 1981. For more detailed background see IBRD Report 4157-MOR "Morocco - Issues and Options in the Energy Sector".

Morocco - Commercial Energy Balance, 1980-83
(thousand toe)

	1980		1981		1982		1983	
	Total	(%)	Total	(%)	Total	(%)	Total	(%)
I. Consumption								
Coal	371	8	445	10	438	9	539	11
Oil	3,866	83	3,897	83	4,085	87	4,103	85
Gas	52	1	65	1	60	1	63	1
Hydropower	397	8	266	6	149	3	125	3
Total	4,686	100	4,674	100	4,732	100	4,850	100
II. Primary Production								
Coal	352	43	416	54	396	64	374	65
Oil and Gas	64	8	82	11	74	12	79	14
Hydropower	397	49	266	35	149	24	125	21
Total	813	100	764	100	619	100	578	100
III. Imports	3,873		3,910		4,113		4,272	

Source: Ministry of Energy and Mines.

2.02 The imbalance between local energy supply and demand has continued to widen over the past four years. Particularly worrisome is the decreasing share of hydropower in energy production due to the severe droughts that have affected the country recently. Because of persistently bad climatic and hydrological conditions the realization of an ambitious hydropower development program is seriously in doubt. In an attempt to reduce its oil imports bill and slow the growth in energy demand, the Government has increased petroleum product prices and has embarked on a campaign to induce energy savings. On the supply side, priority investments are directed towards (i) conversion of major industrial users of energy from oil to coal and development of coal-fired power plants in the future, and (ii) development of feasible indigenous energy resources, i.e., natural gas and coal.

2.03 In the field of natural gas the Bank is assisting the Government (Loan 2271-MOR) in delineating the reserves of the Meskala gas field which, if proven substantial, would be an important source of energy on the Atlantic Coast. For coal, the proposed Jerada project would ensure a steady and expanded supply to the existing users in the Eastern Region. The long-term outlook on the supply side will be greatly influenced both by the stability of the country's climatic conditions and the possibility of developing indigenous resources like oil shale and uranium at reasonable cost.

B. Resource Base

2.04 Coal. Morocco's known coal reserves are located in the Jerada coal basin in the Eastern Region, some 60 km south of Oujda. Coal reserves at Jerada stand at 10 million tons of measured reserves and 50-60 million tons of probable and possible reserves. Jerada coal is anthracitic and

ranges in calorific value from about 5,000 kcal/kg (run-of-mine coal) to more than 7,000 kcal/kg (washed coal). In 1983, annual production was 750,000 tons of which an estimated 650,000 tons were fed to a mine-mouth power plant (165 MW) operated by the Office National de l'Electricite (ONE). In 1984, production is expected to exceed 800,000 tons. The proposed Jerada coal project would bring annual mine production to 1,000,000 tons by 1988, through a modernization program and an extension of mechanization. Coal occurrences have also been found in four other basins (i.e., Tindouf, the Hauts Plateaux, Errachidia and Fquih Ben Sahal). However, because of the estimated depth of the coal bearing strata and the remoteness of these basins, no economic exploration campaign can be envisaged at this time.

2.05 Hydropower and Electricity. Morocco's total hydropower potential is estimated at 4,600 GWH per year (1.1 million toe per year) under average hydraulic conditions. This potential, of which about a third is capacity already developed, is located on three main rivers, i.e., the Moulouya, Sebou and Oum er Rbia. Because of serious droughts in the past few years, utilization of the hydropower capacity has seriously declined. In 1983, while hydroelectric plants represented 37% of the total installed power capacity of 1,650 MW, they contributed only 8% to actual electric power generation. The bulk of thermal power generation comes from oil-fired plants. There are only two coal fired units: the Jerada plant (165 MW) and the Casablanca Roches-Noires plant (120 MW total of which 60 MW are coal fired). In the future, new thermal units including the remaining units of the Mohammedia power plant (2x150 MW, total capacity 600 MW) will be coal-fired. The development of the remaining hydropower potential hinges on the following set of constraints: (i) a predicated improvement of the climatic and hydrological conditions, (ii) a close examination of the economics of the multipurpose dams (see IBRD Report No. 4135-MOR, "Morocco Power Subsector Study") and (iii) a full assessment of the natural gas reserves at Meskala. These questions are being actively discussed by the Bank and the Government in the context of the Bank involvement in both the power and oil and gas subsectors.

2.06 Hydrocarbons. Production of oil from the Gharb and Essaouira basins which peaked at 2,300 bbls/d in 1963, was a modest 350 bbls/d in 1981 (19,000 toe/yr). In addition, some 3 billion cubic feet per year (60,000 toe/yr) of natural gas have been produced from these basins since 1975. In 1981, as part of an exploration project financed by the Bank (Loan S-18-MOR), gas was discovered in deeper horizons of the Essaouira Basin. A follow-up Bank project approved in April 1983 (Loan 2271-MOR) aims at assessing reserves and the production potential of the discovery. Although the full extent and recoverability of these reserves will not be known until early 1985, preliminary results have not matched earlier expectations so far.

2.07 Oil Shale. Estimated oil shale reserves are about 100 billion tons, containing more than 6 billion tons of oil. The most favorable deposit is at Timahdit and contains some 3.3 billion tons of oil shale with an average oil content of 65 liters/ton of shale. A program to assess the technical and economic viability of a commercial exploitation of the Timahdit deposit is presently being undertaken with the assistance of the

Bank (Loan 2114-MOR) but prospects for commercial development of this energy source appear unfavorable.

2.08 Uranium and Other Energy Resources. It is estimated that 60 to 80 billion toe of uranium are contained in Morocco's large phosphate reserves. Uranium extraction for power generation in nuclear plants is, however, not economic at present and is not likely to be developed before the 1990s. Solar and wind resources are relatively abundant, but neither is likely to contribute significantly to the country's energy balance.

C. Energy Consumption

2.09 Per capita energy consumption in Morocco is relatively low compared to other countries of similar economic characteristics. In 1981, Morocco's energy consumption per capita was estimated at about 0.28 toe compared to 0.45 for Egypt, 0.57 for Turkey and 0.50 for Tunisia.

2.10 In 1981, industry accounted for about 42% of final demand for commercial energy. Of total industrial consumption of nearly 1.8 million toe, about 21% was attributable to the phosphate and 24% to the cement industries. The transportation and services sector accounted for an almost equal share (or 39%) of commercial energy demand and agriculture for 4%. Overall, households are the most important energy consuming sector; household consumption is, however, primarily reliant on traditional energy sources and constitutes no more than 15% of commercial energy demand.

2.11 During 1983, substitution of coal for oil led to a tripling of the imported coal tonnage in Morocco. From a level of about 64,000 tons in 1982, coal imports reached 282,000 tons in 1983 with the increase primarily due to the conversion of the second 60 MW unit of the Roches-Noires power plant at Casablanca from fuel to coal and the conversion to coal of two cement plants in Casablanca and Meknes. Approximately one million tons of coal was consumed in 1983.

2.12 Past and Future Trends. Over the 1965-80 period, Morocco's commercial energy demand grew at about 7.4% p.a. on average. This compares with an average annual GDP growth rate of about 5%. The overall growth rate actually slowed somewhat through the period, so that by 1975-80 energy demand growth (of 6.5% p.a. on average) was within 1% p.a. of the (5.6% average annual) GDP growth rate. There was also some shifting of market shares among the three broad groups of commercial energy commodities; electricity; clean liquid fuels (CLF) and boiler fuels,^{2/} as indicated in the following table:

^{2/} Boiler fuels include coal, natural gas and fuel oil.

Morocco - Evolution of Commercial Energy Demand, 1965-95
(million toe and (%))

	Actual		Low	High
	1965	1980	Forecast 1995	Forecast 1995
Electricity	0.3 (20)	1.1 (26)	3.1 (40)	4.7 (40)
Clean Liquid Fuels	0.7 (47)	2.0 (48)	2.8 (37)	4.3 (37)
Boiler Fuels	0.5 (33)	1.1 (26)	1.8 (23)	2.7 (23)
Final Demand	1.5	4.2	7.7	11.7
Losses	0.1	0.5	0.9	1.4
Total	1.6	4.7	8.6	13.1

Source: IBRD Report 4157-MOR.

2.13 Overall, demand for commercial energy is expected to grow from 4.7 million toe in 1980 to between 8.6 million toe and 13.1 million toe in 1995.^{3/} As also indicated in the table, projections for the period 1980-95 imply a continued shift toward electricity from 26% of total consumption in 1980, to 40% in 1995.

D. Energy Supply

2.14 Past Pattern and Potential Future Options. The growth in energy consumption over the 1965-83 period was coupled to a pattern of energy supplies characterized chiefly by three main trends: (i) a declining share of hydropower (from 87% of total electricity supply in 1965 to 8% in 1983); (ii) a parallel decline in the share of coal (from about 28% of total boiler fuel supply in 1965 to 11.5% in 1983); and (iii) a marked shift in favor of oil products, the share of which in total commercial demand rose from about 71% in 1965 to about 85% in 1983, with the major proportion of this increase being accounted for by an increase in supply of fuel oil. In 1970, total demand for fuel oil (direct plus indirect via thermal power plants) represented 33% of the oil market, a fraction which rose to 45% in 1982. Meanwhile, the share of fuel oil in refinery production (excluding non-energy products) rose from 30% in 1970 to 43% in 1983.

2.15 If the present dependence on oil continues, crude oil imports could rise from 4.2 million toe in 1983 to as much as 11.3 million toe in 1995, entailing an increase in the oil import bill from about \$1.0 billion in 1981 to nearly \$3.3 billion in 1995 (in 1983 dollars). On the demand side, the large proportion of Morocco's energy consumption that is not accounted for by fuel oil directly or indirectly offers a variety of

^{3/} Real GDP growth is projected at 3.1% p.a. on average in the 1980-85 period and 5.0% p.a. thereafter. Overall demand for commercial energy is projected to grow at the same rate (low forecast) or at 3% p.a. higher (high forecast). Consumption of traditional fuels is projected to decline very slowly (from 2.59 million toe in 1985 to 2.46 million toe in 1995) as consumers switch to commercial fuels (primarily LPG) at a rate that compensates for population growth.

opportunities for inter-fuel substitution and conservation; and on the supply side, local and imported coal, natural gas and condensates from the Essaouira area, and possibly oil shale could be available to displace imported oil.

2.16 Imported Coal. New thermal power stations and the cement and phosphate industries would represent the most likely major markets for coal. Together they are projected to provide (in the case of high demand and no gas supplies) a potential coal market of about 1.6 million toe in 1990 and 4.0 million toe in 1995. At this level of demand, switching to coal could hold the oil import bill to less than US\$1.7 billion in 1990 (in 1983 dollars). Holding demand growth at the same time to lower levels would reduce the import bill for that year to US\$1.3 billion (1983 dollars).

2.17 Natural Gas. Natural gas and condensates from Essaouira represent the most immediately promising source for alleviating the need for imports of either oil or coal. At present, 37% of the small quantities of natural gas produced annually is consumed in industries, 47% in the phosphate, and 16% in the pulp and paper industries. However, 'new' natural gas, if it were to be available in sufficient quantities, could supply nearly 60% of the total direct demand for boiler fuels and between 47% and 75% of demand in electricity generation. Depending on the growth rate of overall commercial energy demand, the projected market for gas would total between 1.9 and 2.9 million toe in 1990 and between 3.0 and 5.4 million toe in 1995. A preliminary market study is on-going under the current petroleum exploration project to further assess this gas market and rank possible uses for both the gas and condensates. It is presently estimated that if by 1990 gas from Essaouira were available in sufficient quantities to meet market demand, the oil import bill would be held to about US\$1.1 billion (1983 dollars).

B. Sector Organization

2.18 Sectoral planning, coordination and policy making is the responsibility of the Ministry of Energy and Mines (MEM). The MEM, created in 1977, has three operating directorates: the Directorate of Energy, the Directorate of Mines, and the Directorate of Geology. In addition to its planning and policy-making role, MEM supervises most of the public enterprises in charge of managing the different energy subsectors, in particular: the Office National de Recherches et d'Exploitations Pétrolières (ONAREP) for hydrocarbon and oil shale exploration and development; Charbonnages du Maroc (CdM) for coal exploration and development; the Office National de l'Electricité (ONE), for electricity generation; a petroleum products agency (SNPP), and two petroleum refineries (SAMIR and SCP). MEM is also involved in the development of renewable energy and has recently established the Centre pour le Développement des Energies Renouvelables (CDER) in Marrakech.

2.19 In the coal subsector, CdM is the single coal production institution and is also directly in charge of coal exploration and export marketing. A CdM subsidiary, SOCOCHARBO, is the only coal marketing

company within Morocco and also presently the sole importer of coal in the country. In the power sector, ONE generates approximately 90% of the electric power in the country, transmits it to the load centers, and distributes about 40% of its production outside the large cities. Distribution of power in large urban areas is the responsibility of Regies which are autonomous public enterprises under the supervision of the Ministry of the Interior.

F. Energy Pricing and Conservation

2.20 Pricing. During the past three years the Government has undertaken a serious effort in the pricing of energy both to encourage conservation and the development of indigenous resources. In practice this has meant higher prices than their opportunity costs for oil products and adjustments close to import parity levels for domestic coal. Prices of domestic anthracite fines (5,200 kcal/kg) increased almost fourfold in three years, i.e., from DH 128/ton in 1981 to DH 464/ton in 1984. The Government has also removed most of the taxes and duties on imported coal (1982-83) to stimulate switching from imported oil to imported coal.

2.21 Electricity tariffs, however, remain far below their economic cost. These tariffs need to be generally increased and their structure rationalized, both to facilitate the financing of power investments, and to stimulate more efficient use of electrical energy. The Bank is pursuing an active dialogue with ONE and the Government on this issue. The Government is presently reviewing the gas pricing issue, with the intention of setting an appropriate price for all 'new' domestic gas supplies. The uncertainty as to the volume of future supplies from Meskala complicates the determination of such a policy, as the utilization options and related opportunity costs for gas are partly a function of the volume of supply. Nevertheless, the Moroccan fuel oil market is large, and much of it could be switched to gas. For the time being, a gas price linked to that of fuel oil (with enough of a discount to justify conversion and rapid market penetration) would therefore be appropriate until reserves are found to be sufficiently large that it appears advantageous to encourage lower value uses. This issue is also being addressed by the Bank within the context of the petroleum project (Loan 2271-MOR).

2.22 Energy Conservation. In the area of energy conservation the Government undertook in July 1983 a major study on energy conservation in industry. The study has already provided an extensive data base for the industrial sector in the area of energy conservation and as a first policy measure, the Government is now providing monetary incentives to an amount of DH 500 for each toe conserved (equipment credits). The Bank has estimated that conservation measures in the industrial sector could save the Moroccan economy some 80,000 toe per annum at a cost of about US\$40 million. It is expected that most of these measures will be implemented following completion of the study.

G. Government Strategy

2.23 The Government has three main policy objectives in the energy sector: (i) to encourage fuel import substitution leading to foreign exchange savings, (ii) to promote efficient energy use and (iii) to mobilize and increase domestic resources. The ambitious five-year development plan (1981-85) was prepared along these lines. The increasing financial strains of the past years have slowed down considerably the pace of investments in the sector. Nevertheless some priority investments, i.e., in oil and gas and fuel switching are underway and should contribute to ease the country's balance of payments problems. These financial constraints make it more urgent to (i) reinforce the process of selection and coordination of energy and energy-related investments and the management and organization of public sector enterprises; and (ii) improve the present energy pricing structure. In particular, both for ONE and ONAREP opportunity cost pricing for electricity and gas should be adopted if resource allocation is to be efficient. For coal, although the present pricing is considered adequate, a Government commitment to maintain internal coal prices close to import parity levels is essential for CdM's viability. During negotiations the principal objectives of the Government's future energy policy were discussed and found to be satisfactory. The dialogue between the Bank and the Government on implementation of this strategy could be pursued in the course of the preparation of future energy related projects.

III. THE COAL MARKET IN MOROCCO

A. Local Production and Markets

3.01 Jerada coal has in the past been primarily marketed in Morocco. The main reasons are that (a) because of the coal's friable nature most of Jerada's coal production consists of fines (80%) which, although being anthracitic, cannot be sold on the international anthracite markets which require a very high quality product; and (b) the Jerada power plant was built in that location with the prime objective of consumption of Jerada coal and is capable of absorbing large quantities (up to 700,000 tons) if running at full capacity. The following table gives a summary of Jerada production, domestic sales and export sales, with differences between sales and production due mainly to inventory carryover.

Jerada - Coal Production and Sales
(000 tons)

<u>Year</u>	<u>Production</u>	<u>Domestic Sales</u>	<u>Export Sales</u>	<u>Total Sales</u>	<u>Share of Export Sales in Total Sales (%)</u>
1970	433	375	58	433	13
1975	652	728	18	746	2
1980	680	630	90	720	13
1981	703	743	61	804	8
1982	735	706	28	734	4
1983	751	667	38	705	5

Source: CdM.

Export sales have fluctuated between 18,000 tons in 1975 and 90,000 tons in 1980 (representing 2% and 13% of sales respectively) due to various factors including variations in exportable quantities, and pace of sales on local markets. CdM's principal export markets have been France and the U.K. but small quantities have also been sold to other European countries.

3.02 On the domestic market the principal client for Jerada coal has been ONE, which purchased mainly for the Jerada power plant (between 480,000 and 690,000 tons), but smaller quantities (13,000 to 32,000 tons) have been shipped to the Oujda power plant (now out of service) and most recently to Casablanca. A second group of important customers are the sugar plants which have taken between 17,000 and 43,000 tons per year since 1974. Household consumption of high quality anthracite ranged between 25,000 and 30,000 tons per year. Other clients purchasing smaller quantities have been smelters, and other mining companies. CdM itself has consumed between 5,000 and 10,000 tons yearly. SOCOCHARBO, a CdM subsidiary based in Casablanca, is responsible for marketing of CdM coal which is not directly delivered to the Jerada power plant or exported. The main function of the company has been in the past to serve the needs of home heating, sugar factories and smelters. However, on-going conversions of power plants and cement plants to coal have diversified the company's clients and have resulted in a dominating, quasi-monopolistic role of SOCOCHARBO in coal imports which have to cover the gap between actual consumption of coal needs and the Jerada production.

B. Coal Imports

3.03 Through 1981 coal imports were relatively stable and consisted to a large extent of coking coal for sugar plants and smelters.

MOROCCO - Coal Imports
(000 tons)

<u>Year</u>	<u>Coking Coal</u>	<u>Steam Coal</u>	<u>Total</u>
1975	13	15	28
1980	22	7	29
1981	35	10	45
1982	24	41	65
1983	30	252	282

Source: SOCOCHARBO.

In view of the substantial cost differentials between energy produced from coal and oil, however, ONE and other consumers (cement plants) in Morocco took the decision to convert their plants from oil to coal. These decisions started to have a major impact in 1983 when 280,000 tons of coal were imported, of which about 150,000 by ONE and more than 50,000 for cement plants. Currently ONE operates one 60 MW unit of its Roches Noires plant at Casablanca with coal, with an annual consumption between 150,000 and 200,000 tons of coal. In addition ONE will start operating the extension of its Mohammedia power plant with coal in 1985. The cement plants Lafarge in Casablanca and Cadem in Meknes started to operate with coal in 1983, and the Cimenterie de l'Oriental (CIOR) cement plant near Oujda will start to operate with coal in 1985. Other cement plants (Agadir, Tangiers, and Tetouan) are also planning to convert to coal use. In view of the conversions under way or planned, and abstracting from the proposed expansion of coal production at Jerada, coal imports would increase substantially between 1984 and 1986. The following table summarizes these forecasts by category of users.

Morocco - Forecast Coal Imports a/
(000 tons)

	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987-88</u>
ONE/Casablanca	180	180	200	200
ONE/Mohammedia	-	420	800	800
Total ONE	<u>180</u>	<u>600</u>	<u>1,000</u>	<u>1,000</u>
<u>Cement Plants</u>				
CIOR (Oujda)	30	150	160	160
Cadem (Meknes)	80	70	70	70
Others	90	140	305	335
Total Cement Plants	<u>200</u>	<u>360</u>	<u>535</u>	<u>565</u>
Total	380	960	1,535	1,565

a/ Excluding coking coal and under the assumption of Jerada coal production of 800,000 tons, i.e., before project situation.

Source: SOCOCHARBO.

C. Pricing

3.04 Coal prices in Morocco are set by an interministerial commission where the Ministry of Economic Affairs and MEM play a significant role. For the past 4 years, these prices have been reviewed annually and adjusted on an ad hoc basis. Domestic Free on Rail prices for Jerada Coal in 1984 stood at DH 464/t (US\$54.0/t) for fines sold to ONE (80% of total production) and an average of DH 670/t (US\$77.0/t) for good quality anthracite. Export prices averaged DH 900/t (US\$100/t) FOB Moroccan port. In 1984, prices for imported steam coal in Morocco for power generation and cement factories (quality equivalent to Jerada) have averaged US\$40-45/ton CIF Casablanca and US\$60-65/ton FOR Casablanca with demurrage, handling and other fees in the order of US\$7/ton and taxes in the order of US\$13/ton. Internal transport costs were about US\$2.3/t km for rail transport and US\$10/ton for truck transport between the Port of Nador and Oujda where there is no railway link. The table below shows 1984 Jerada Coal price competitiveness with imported coal for Cdm's largest customer, ONE Jerada, and its future major customer CIOR. For comparison, also a coal-fired power plant on the West Coast is included.

Imported Coal vs. Jerada Coal
(1984-US\$/t - excluding taxes and duties) a/

	<u>Coal Price b/</u>	<u>Handling Fees</u>	<u>Transport</u>	<u>Total</u>
A. <u>ONE Jerada</u>				
1. Jerada Coal	54.0	-	-	54.0
2. Imported Coal <u>c/</u> (Nador)	60.0	7.0	10.0	77.0
Jerada Comparative Price Advantage				23.0
B. <u>CIOR (Oujda)</u>				
1. Jerada Coal	54.0	-	2.0	56.0
2. Imported Coal	45.0	7.0	10.0	62.0
Jerada Comparative Price Advantage				6.0
C. <u>West Coast Power Plant</u>				
1. Jerada Coal	54.0	-	14.0	68.0
2. Imported Coal (Casablanca)	45.0	7.0	-	52.0
Imported Coal Comparative Price Advantage				16.0

a/ Taxes and duties on average US\$13/t; exchange rate US\$1 - DH8.65.

b/ FOR price for Jerada coal, CIF price for imported coal of equivalent quality.

c/ Because of the special design of the Jerada power plant boilers only anthracite fines can be burned, which account for the higher CIF price.

3.05 The situation depicted in the table above will in all likelihood continue to prevail during the end of the 1980s and beginning 1990s.

Although a new, imported coal based plant on the West Coast would have lower fuel costs than the existing Jerada plant (US\$52/t compared to US\$54/t), the high capital costs involved to replace the Jerada plant (US\$1.2 million per MW installed) and the foreign exchange outlays in fuel costs make this an unattractive proposition, given the sunk investment already in place at Jerada and a remaining useful life of at least 15 years.

3.06 While the present pricing structure does not fully reflect the opportunity cost of Jerada Coal it represents a considerable improvement over past pricing policies (para. 4.26). With an average realized price of DH 500/t (US\$58.0/t) in 1984, CdM is easily able to cover unit production costs of DH 442/t (US\$51/t) (para. 7.03). To preserve CdM's viability in the future and also maintain access of consumers to competitively priced coal, the Government would ensure that the selling price for Jerada coal (FOR Hassi Blal railhead) is at least equal to 85% (but not more than 100%) of the opportunity cost of such coal. This opportunity cost would be derived from the average CIF price of imported steam coal (adjusted to the heating value of Jerada fines) during the previous calendar year, plus port and handling fees, and estimated transport costs to Jerada. The price for fines (80% of production) would then be set in the range of 85-100% of the calculated opportunity costs, thus allowing for some flexibility, in order to set prices competitively for CIOR and to take into account the unfavorable location of the Jerada power plant. On the basis of the above formula the Government would review selling prices for Jerada fines once a year upon CdM's proposal and consult with the Bank before November 30 of each year on their level. The Government would then adjust the selling price not later than December 31 of that year to meet the above requirements. Assurances to this effect were obtained at negotiations. This procedure would not only assure CdM's financial health but also provide for protection against foreign exchange risks of loan repayment because of the link of revenues to international coal prices.

D. Jerada's Future Coal Markets

3.07 The table below presents a likely distribution of Jerada's future production. ONE's Jerada power plant is currently under partial overhaul and should be fully operational again by 1985. It would then be capable of absorbing about 700,000 tons of coal (fines) per year. To ensure a continuous outlet for Jerada fines, CdM has entered into a long-term coal supply agreement with ONE which was discussed during negotiations and is considered satisfactory. The CIOR cement factory, which is close to the Jerada mine and linked to it by a rail connection, will consume about 150,000 tons per year by 1986. In October 1984, CIOR's management in a letter to CdM clearly stated its intention to purchase this amount from Jerada provided that prices do not exceed prices of equivalent imported coal. Appropriate long-term arrangements between CdM and CIOR are expected to be concluded once CdM's production is sufficient to supply the cement plant. Sales to the sugar factories are likely to range around the same level as in the past and can be estimated at 40,000 tons per year. Household consumption, CdM's own consumption and other clients can be expected to absorb another 40,000 tons while the export market is estimated at 70,000 tons.

Jerada - Future Coal Markets
(000 tons per year)

Jerada Power Plant	700
CIOR	150
Sugar Factories	40
Households, CdM and Others	40
Exports	70
Total	<u>1,000</u>

IV. THE BORROWER

A. Background and Production Performance

4.01 The discovery of the Jerada coal deposit dates back to 1908 although systematic exploration did not take place until 1927. The first company to exploit the deposit was created in 1929 with participation of Bureau de Recherches et de Participations Minières (BRPM), the French Government, French and Belgian commercial interests and a few individual shareholders. In 1946 this company was named Charbonnages Nord-Africains (CNA). In 1957 the Moroccan Government took over the part of shares held by the French Government to increase the BRPM share in CNA to 48%, and subsequently to 54% (1964) and 99% (1972) through purchase of the shares of the other shareholders. A further change was introduced in 1981 when CNA became Charbonnages du Maroc (CdM). Even though CdM has remained a stock corporation (societe anonyme), it operates as a public enterprise and is subject to financial controls similar to those applicable to public enterprises. The Board of Directors consists of 14 representatives of public institutions including BRPM, the Ministries of Finance, Energy and Mines, Planning, and Equipment, and the Governor of the Province of Oujda.

4.02 Production started in 1932 with 15,000 tons of anthracite and increased gradually to a level of about 200,000 tons around 1940. After intervention of the Government and implementation of a rehabilitation plan, production continued to grow and reached 360,000 tons in 1952. In the early 1970s a further rehabilitation program was implemented which included as essential elements substantial increases of wages and salaries, a review of the wage and incentive structure, and introduction of improvements in underground working conditions and leading to an increase in production of 400,000 tons in 1970 to 700,000 tons in 1977.

4.03 Subsequently production stagnated, fluctuating around 700,000 tons until 1981. While productivity remained around 1,050 kg/manshift until 1979 it declined thereafter to the present level of 800 kg/manshift due mainly to increased mining in deeper and more difficult areas of the deposit without adequate planning and investments. During the same period the Government adjusted domestic coal prices at a pace slower than that of prices of imported fuels with the main purpose of protecting consumers of electricity. Declining productivity and inadequate price adjustments

resulted in operational losses after 1979 and in debts accumulating to about DH 150 million. A new dynamic management team has been trying since 1980 to reverse the declining trend through increased efforts to achieve improvements in working conditions, mechanization trials and organizational measures aimed at increasing efficiency underground.

4.04 In addition to its importance for local electricity production, the Jerada mine plays an important role in the local economy of the border province of Oujda. It is the largest employer in this province with a workforce of about 6,500. The town of Jerada depends entirely on mining activities and has about 50,000 inhabitants, many of them family members of miners but frequently engaged in other activities such as trading or handicrafts. CdM operates a training center which, because of high personnel fluctuation, also has considerable effects outside CdM. Further activities promoted or directly run by CdM in Jerada are medical services, provision of housing for staff and workers, artisanal and cultural activities and garment making.

B. The Jerada Coal Deposit

4.05 The Jerada coal deposit, together with the Algerian Kemadza deposit, is the only source of coal production in North Africa. The deposit is located about 60 km southwest of Oujda in a hilly, semi-arid area with an average altitude of about 1,000 m (Map 18452RI).

4.06 The most reliable and valuable information about the structure of the deposit derives from the existence of a multitude of galleries and inclines driven during the past 50 years of exploitation in the eastern section of the basin. Additional knowledge of the deposit is available from shallow and deep drillholes and extensive surface mapping, again concentrated mainly in the eastern portion of the basin. Whereas the eastern section is well explored, the extension of the western portion of the deposit is only known from 10 deep drillholes of which 5 intersected the basin's coal-bearing strata. However, the good knowledge of the eastern section allows a relatively reliable interpretation of the general structure of the total deposit.

4.07 The coal basin has an extension of about 22 km in east-west direction and a width of about 4 km in north-south direction. The area covered is about 60 km². In the eastern portion, over an area of about 17 km² the coal seams bearing strata (of carboniferous geological age) are outcropping to the surface. In the western portion, over an area of about 43 km², they are overlain by younger rocks of liassic and triassic age. The deepest point of the basin (depth of lowest minable seam) in the uncovered eastern portion of the coalfield is about 500 m below the surface and in the covered western portion about 1,000 m below the surface or 400 m below the secondary rock overlying the coal-bearing strata.

4.08 The coal seams are heavily folded and faulted. Folding is particularly pronounced in the southern half of the basin where, in general, three synclines occur, with the majority of coal reserves in steeply (60-90°) inclined flanks of the synclines. Folding is less

pronounced in the central and northern portions of the coal basin, where seams are mostly inclined at an angle of about 30°. Some major faults run across the coal basin mainly from north to south. In the eastern portion of the basin, major faults have led to the delineation of two smaller coalfields (Bassin Nord and Secteur Est) apart from the main coal basin.

4.09 The coal basin contains four minable coal seams which are indexed, from the bottom upwards, as seams A, B, C and F (Map IBRD 18453). The thickness of these seams varies in general between 0.5 and 0.9 m. Only occasionally does thickness reach 1 m. There are a number of other seams which are too thin for mining. The perpendicular distance between the seams A, B and C is about 25 m and between seam C and F 140 m. The minable seams are regular in thickness and there are little rock inclusions in the coal. Hangingwall and footwall consist of shale. Rock pressure can be considered normal and is comparable to many West European coal mines. Possibilities for mechanized mining are restricted due to the low seam thickness, inclination of the seams, and occasional inclusions of sedimentary rock or basaltic dykes in the coal.

4.10 Total exploitable reserves of the Jerada coal basin are expected to be in the order of 50 million tons. A more reliable estimate of coal reserves, however, is only available for the better explored eastern portion of the basin (east of longitudinal 791,800, about 20 km² or one third of the coal basin surface). Here coal reserves as of mid-1984 are as follows:

Jerada - Proven Coal Reserves
(million tons)

	<u>Bassin Nord</u>	<u>Secteur Est</u>	<u>Main Basin</u>	<u>Total</u>
Seam F and C a/	0.1	0.2	3.2	3.5
Seam B	0.1	0.4	4.5	5.0
Seam A	-	0.7	2.6	3.3
Total	<u>0.2</u>	<u>1.3</u>	<u>10.3</u>	<u>11.8</u>

a/ Since seams F and C have been found to be too thin in some areas of the existing mine for mining or with excessive rock inclusions, their reserves are only accounted to 50%.

Source: CdM and BME, 1984.

About 35% of these reserves occur in seam sections with steep (more than 30°) inclination and 65% in seam sections with moderate (less than 30°) inclination.

4.11 The coal, in situ, is of good anthracitic quality with high heating value, low volatile content and low levels of ash and sulfur. The table below lists average values for these properties.

Jerada - Key Coal Characteristics a/

Heating Value	about 8,000 kcal/kg
Volatiles	4.0-5.0%
Ash	5.0-6.0%
Sulfur	0.9-1.0%

a/ Values referring to dry coal without rock inclusions.

Source: B. Owodenko (1976)

The coal is friable and breaks down into fine particles when mined. Due to the thinness of the seams, a relatively high amount of rock is contained in the run-of-mine production, which is easily separated from the coal by washing.

C. Underground Mines

4.12 The Jerada deposit is presently being mined by three small underground mines which are not interconnected: the Bassin Nord mine, the Siege IV mine, located in the Secteur Est, and the Siege V mine, located in the southeast of the main basin (see Map 18453). Some key data on these mines are presented in the table below:

CdM - Key Mines Data
(end 1983)

	<u>Production a/</u> <u>Mt/year</u>	<u>Average</u> <u>Depth</u> <u>m</u>	<u>Reserves</u> <u>Mt</u>	<u>Underground</u> <u>Workers</u> <u>Men</u>	<u>Productivity</u> <u>t/manshift</u>
Bassin Nord	0.18	100	0.2	855	0.9
Siege IV	0.24	150	1.3	1,157	0.9
Siege V	0.33	500	10.3	2,572	0.6
Total	<u>0.75</u>	<u>300</u>	<u>11.8</u>	<u>4,584</u>	<u>0.8</u>

a/ Saleable product.

Source: CdM, 1983

Siege V is the newest mine, and, situated in the main coal basin, will become in the near future the only supplier of coal after depletion of the two smaller basins. Bassin Nord reserves will be depleted as soon as 1986 and Secteur Est reserves (Siege IV mine) in 1992. Productivity of the Siege V mine is lower due to a more complex network of galleries which has its origin in insufficient and inconsistent mine planning (para. 4.14). Preparation of the Siege V mine for increased production and improved productivity with a simultaneous simplification of its underground network of galleries is the main objective of the proposed project (para. 5.05).

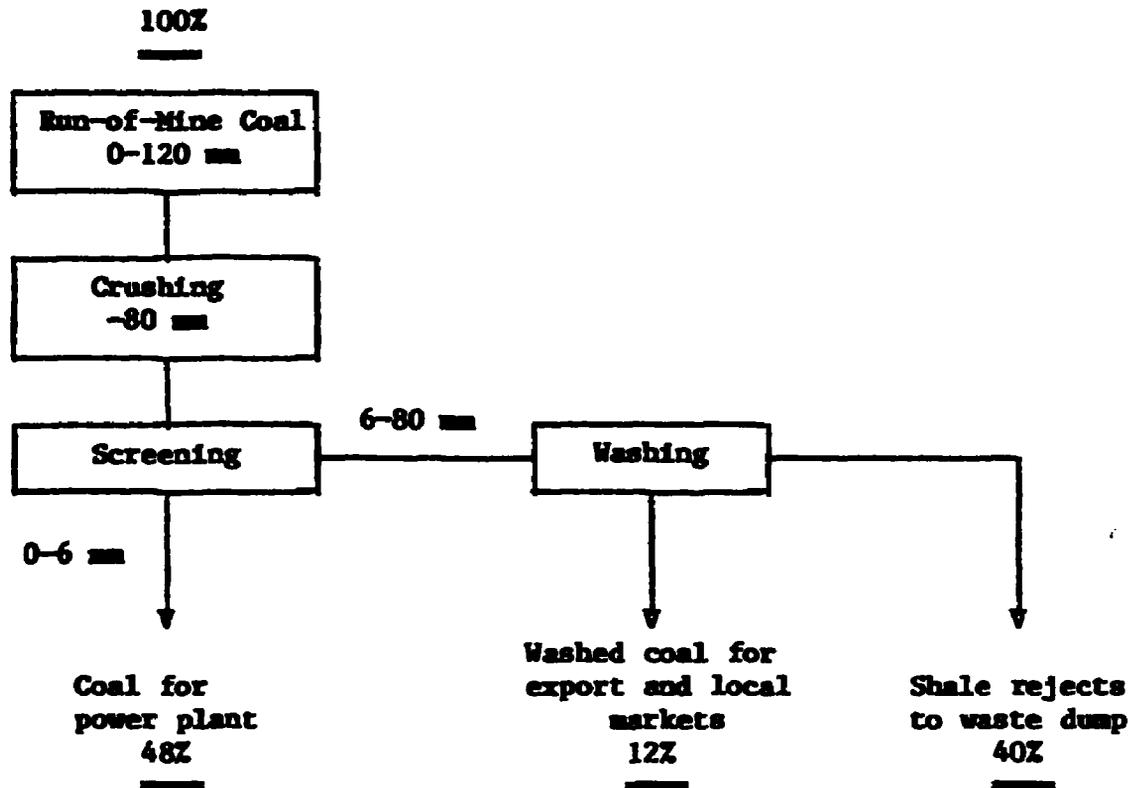
4.13 All mines employ the longwall mining technique. There are only 2 semi-mechanized longwall faces (equipped with coal plough, armored conveyor and individual hydraulic props for roof support) operating in Siege V. In 1983, they accounted for less than 10% of CDM's production. All other faces (on average 25 in operation in 1983) are non-mechanized; 58% are found in seam sections inclined less than 30° and 42% in seam sections inclined more than 30°. The average face length is 110 m and the average daily advance 1.2 m. The coal is transported from the face with conveyors through a network of galleries and inclined shafts to the surface. The average underground transport distance is about 3 km. Waste rock mined with the coal seams and the galleries advanced in rock, is added to the conveyors. The average run-of-mine coal thus has a waste ballast content of about 40%.

4.14 Galleries and shafts have been driven mainly when needed to secure production for the immediate future due to both, lack of sufficiently farsighted and consistent mine planning and lack of financing. In particular in the Siege V mine, this has resulted in an overly complicated underground network of galleries and inclines, making transportation and ventilation more difficult which in turn reduces significantly the productivity of underground labor and increases safety and health hazards. Investments to simplify the network and to install efficient transportation and ventilation equipment are needed. Furthermore, insufficient preparations have been made in the main basin (Siege V mine) to accommodate additional production capacity needed to replace production from the depleting Bassin Nord and Siege IV mines. Some main galleries and a new shaft have to be constructed for this purpose.

D. Surface Installations

4.15 A central washing plant is located at the exit of the inclined shaft of Siege V. It receives coal from the Bassin Nord and Siege IV mines by trucks and railway cars over a distance of 2 km and 7 km, respectively. The plant consists of crushers, screens and jigs for coarse and intermediate size coal. It employs 220 people and has a capacity of at least 1.0 million tons of product. A simplified flowsheet and mass balance is presented in Figure 1 below:

Figure 1: Coal Washing Flowsheet and Mass Balance



The washed coal has an average heating value of about 7,500 kcal/kg and an ash content of 5-10%. It is produced in 4 size classes ranging from 6 to 80 mm. It represents 20% by weight of the total saleable product. The unwashed fine coal (0-6 mm) has an average heating value of about 4,800 kcal/kg, an ash content of 30% and represents about 80% by weight of the total saleable product. Leaving the washing plant, the fine coal is transported directly by conveyor over a distance of 0.6 km to ONE's power plant.

4.16 Operation of the washing plant is well established and largely problem-free. Plant outlay and most equipment is appropriate for a 20-30% increase of throughput. Relatively minor investments will be required to ensure that with an increased amount of waste rock from gallery headings and mechanized coal faces the ash content of the fine coal for the power plant will not exceed 30%, as required by boiler design. In addition, a new waste shale dump will have to be started as the old dump is being filled up.

4.17 The ONE power plant consists of 3 units of 55 MW each. It was constructed in the mid-1960s under a contract with the USSR. The plant supplies base load power and is interconnected with the national grid. Yearly supply of electricity is about 1,100 GWh, equivalent to a coal consumption of about 650,000 t/year. There is a coal storage capacity at the power station of 50,000 tons.

E. Organization and Management

4.18 Cdm's head office is located at Rabat. It is the seat of the company's chief executive (Administrateur Delegeue) as well as of the sales, purchasing, and administration and finance departments, which would operate less effectively from Jerada. The Rabat office also maintains close liaison with the different ministries. All operations at Jerada are directed by the General Manager, whose office is at Jerada. The General Manager controls about 30 departments and services at Jerada (the most important ones are shown in Annex4-1). Presently, many of the services report directly to the General Manager. There is no interference from the Rabat office with the operations at Jerada.

4.19 Cdm's total staff at the end of 1983 numbered about 6,500, out of which about 6,420 are employed at Jerada and 80 at Rabat. The table below gives a breakdown into major categories.

CdM - Employment
(end 1983)

	<u>Jerada</u>		<u>Rabat</u>	<u>Total</u>
	<u>Underground</u>	<u>Surface</u>		
Management and Engineers (Cadres)	33	18	18	69
Foremen (Maitrises)	309	271	63	643
Workers (Ouvriers)	4,584	1,198	-	5,782
Total	4,926	1,487	81	6,494

Source: Cdm.

4.20 Cdm in the past suffered from a high turnover among its managers mainly because of the remote location of Jerada, the limited housing available as well as poor career development prospects. In particular at Jerada, management changes made it difficult to establish a consistent long term mine development program whereas execution of the daily production task due to the long experience of the more stable lower production management, did not represent serious problems. Since 1981 however, the situation has improved substantially with increases in salaries and provision of new housing facilities.

4.21 In order to carry out the project effectively, Cdm proposed a revised organization chart and staffing which were discussed during negotiations and found satisfactory by the Bank. The proposed changes were subsequently implemented and, starting in February 1985, only four main line managers will directly report to the General Manager, each of them with clearly defined responsibilities. The line managers are: Technical (surface installations), Production, Planning and Administrative. The Production, Technical and Administrative Managers have already been appointed while a technical assistant, recruited under the technical assistance contract with BME will assist the General Manager in the tasks related to planning until a Planning Manager has been trained and appointed. In order to assure effective Project implementation, Cdm has created the post of Project Coordinator and has appointed a qualified staff to that post, directly reporting to the General Manager.

4.22 Cdm's Jerada operations traditionally have also suffered from a high turnover rate (20-25%) among workers, largely due to dependence on migrant labor. Although this pattern will likely persist in future, the level is expected to be reduced due to Cdm's efforts to provide more and better housing. Cdm maintains training programs for unskilled and skilled labor up to the foreman level and has no difficulty in recruiting a sufficient number of experienced key workers and lower level supervisors. One area however, where recruitment has been difficult, in particular at the engineer's level, is the electric and mechanical services. Cdm has recognized this and in addition to a special housing program for engineers, intends to improve working conditions through the above mentioned organizational changes and reinforcement of these services.

F. Accounting, Auditing Practices and Financial Reporting

4.23 Cdm's Administrative and Finance Department, headed by a department director, comprises the following four divisions (i) the Accounting Division in charge of general and cost accounting; (ii) the Information Systems Division responsible for all data processing related to financial matters; (iii) the Financial Analysis Division which establishes annual budgets of operations and investments; and (iv) the Administrative Division which deals with personnel matters and compensation.

4.24 Cdm is subject to financial control by the Ministry of Finance. A financial controller is assigned to the company and has to approve all purchases exceeding DE 50,000 (US\$5,300). In addition, the financial controller is entitled to verify accounting information at all times and to ask for financial data not contained in regular reports. Cdm's accounting system is well organized and provides up-to-date accounting information.

4.25 Cdm's accounts are now audited by the Ministry of Finance. Cdm would be required in the future to use independent external auditors acceptable to the Bank. Cdm would provide to the Bank no later than six months after close of its fiscal year audited financial statements for that year. However, submission of the first audited financial statements would be due July 31, 1985 for Cdm FY 1984. Assurances to this effect were obtained at negotiations.

G. Production Costs

4.26 Between 1974 and 1979 domestic prices were sufficient to cover Cdm's production costs and provide for an additional positive margin. After 1979 however, coal prices were adjusted by rates lower than those of production cost increases, which resulted in negative margins between set prices and unit costs. These margins have been the principal reason for operational losses between 1980 and 1983. A drastic change in the Government's price setting policy entailed a series of coal price increases in 1983 and early 1984 which brought their level close to that of import parity prices of steam coal giving Cdm a profit margin of 13%. Given the current levels of prices and of production costs, a positive margin can be expected in 1984. The table below summarizes the development of average sale prices and Cdm unit costs on a yearly basis:

**Table 4.5: CdM - Average Coal Price and Unit Cost
(DH/t in current terms)**

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Average Coal Price	98	109	134	141	148	147	189	260	263	345	500
Unit Production Cost	97	103	112	121	129	142	195	252	335	398	442
Average Coal Price/Unit Cost (%)	101	106	121	117	115	104	97	103	79	87	113

Source: CdM.

4.27 The most important item in the unit costs are wages and salaries which have accounted for between 40% and 50%^{5/} of the total over the last few years. The second most important item is consumables accounting for 10-15% while administrative charges have averaged 8%, health costs (silicosis) 4%, and depreciation charges which increased over the period from 6% to 18% due to previous investments for opening of new mine areas and for equipment. The substantial increases in unit cost during 1979, 1980, 1981 are explained by (i) a series of salary increases for mine workers (15-20% per year) as a result of collective bargaining agreements and (ii) a substantial increase in depreciation due to capitalization of a large number of galleries underground.

4.28 CdM's unit production cost of DH 442/t (US\$51/t) in 1984 for coal with an average heating value of 5,500 kcal/kg is high relative to unit cost for large steam coal mines in the U.S., Australia or South Africa where unit costs are US\$20-40/t and heating values 6,000-6,500 kcal/kg. However, Jerada's costs compare well with international anthracite producers which range from about US\$25/t (China) to US\$100/t (Western Europe) for anthracite of the same heating value. CdM's future production costs are discussed in para. 7.03. The competitiveness of Jerada coal in the Moroccan coal market has been discussed in paras. 3.04-3.06.

H. Past and Present Financial Performance

4.29 CdM's historical financial statements are presented in Annex 4-2. The following table summarizes CdM's past financial performance.

^{5/} The average wage bill per employee in 1983 was about US\$2,500 equivalent.

CdM - Summary of Past Financial Performance
(DH million in current terms)

Year ended December 31,	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u> ^{a/}
Production (000 tons)	680	703	735	751	800
Sales Revenues	167.2	217.6	232.3	318.6	368.0
Total Costs ^{b/}	181.0	219.4	289.6	345.4	358.0
Net Income	(13.8)	(1.8)	(57.3)	(26.8)	10.0
Net Profit	(11.9)	(3.9)	3.3	-	10.0
Net Fixed Assets	223.7	230.3	296.1	301.9	338.0
Current Assets	62.0	76.8	96.0	135.1	138.1
Current Liabilities	122.4	153.5	192.4	79.0	76.5
Long-Term Debt ^{c/}	50.8	35.3	37.3	185.5 ^{c/}	161.1
Equity and Provisions	112.5	118.3	162.4	172.5	238.5
<u>Ratios</u>					
Current Ratio	0.51	0.50	0.50	1.71	1.81
LT Debt/Equity	31:69	23:77	19:81	52:48	40:60

^{a/} Forecast as of October 1984.

^{b/} In 1982 all depreciation for the year was deferred. In 1983 DH 27.3 million out of DH 67.0 million were deferred.

^{c/} In 1983 all short-term debts due to CNSS, ENDE were transferred from current liabilities to long-term debt.

4.30 As discussed above, the low level of coal prices during the past 4 years has had a detrimental impact on CdM's finances. The Company has suffered serious operational losses during these years and has had to default on amounts due to the social security system (CNSS) and other banks to continue its operations. As a result of Government decisions in 1983 these short-term debts have now been consolidated and rescheduled (para. 4.31). The Moroccan fiscal regime does not allow companies to carry over losses for more than 5 years, but permits deferral of all or part of their yearly depreciation. CdM used this feature during 1982 and 1983 and deferred some DH 88.2 million in depreciation. The liquidity position of the Company (because of the debt rescheduling) has improved notably with a current ratio increasing from 0.5 in 1982 to 1.7 in 1983. For 1984, the latest coal prices increases have had a positive effect on CdM's finances with a forecast income of DH 10 million for the year and a relatively strong liquidity position, i.e., a current ratio of 1.8.

I. Debt and Financial Restructuring

4.31 Over the last three years, CdM in order to avoid bankruptcy reduced the amount of investments for rehabilitation and modernization of the Jerada mine and did not pay amounts due to the social security system (CNSS) and to credit institutions for repayments of due debts. While CdM continued servicing its suppliers' credits, it started negotiations with CNSS, Caisse Centrale de Garantie (CCG) and Banque Nationale de

Developpement (BNDE) on rescheduling the remaining debt (about DH 170 million in 1983). Despite government subsidies and improving financial prospects due to higher coal prices it was clear that the amounts due could not be repayed from the 1984 cash flow if operations were to continue normally and necessary investments were to be carried out. In November 1983, CdM reached an agreement with CNSS (concerning about DH 100 million) on rescheduling of the total amount due over 20 years without interest but indexed to the price of Jerada coal. Negotiations with the Government, CCG and BNDE concerning some DH 70 million were concluded in January 1985. The solution adopted involves the repayment of CdM debts due to CCG (about DH 25 million) by the Government out of 1984 budget allocations for CdM, rescheduling of debts to BNDE, amounting to about DH45 million, over 20 years, and payment by CCG of outstanding interest on this debt amounting to about DH 10 million.

4.32 The solution adopted by the Government for financial restructuring of CdM was discussed during negotiations and found satisfactory by the Bank.

V. THE PROJECT

A. Project Origin and Preparation

5.01 The project concept was first presented to a Bank mission in September 1981. At that time it was concluded that Bank involvement was premature for the following reasons:

- (i) the development strategy presented was too ambitious, proposing an expansion to 2.0 mtpy in a 5-6 year period;
- (ii) proposed underground mechanization was still untested at Jerada; and
- (iii) a major financial restructuring of CdM as well as an adequate coal pricing policy were needed.

5.02 During the past 3 years, the Bank was instrumental in persuading the Government to establish appropriate coal prices, reschedule CdM's debts and helping CdM define a reasonable rehabilitation and expansion program. After the first trial longwall face had been successfully operated with a coal plough and individual hydraulic props, and important price increases were instituted for Jerada coal, a Bank mission visited Morocco again in March 1983. Agreement was reached that the project scope would be refined, that the Government would further adjust coal prices and reschedule the company's debts, and that an experienced foreign consultant would carry out a feasibility study of a modernization/expansion project. The terms of reference for this study included:

- (i) a review of the geological data base;

- (ii) a detailed plan for modernization of the mine and expansion of production from 0.75 to 1.0 million tons per year together with an evaluation of the technical/economic feasibility; and
- (iii) definition of project implementation steps required.

5.03 Belgian Mining Engineers (BME) were selected to carry out the feasibility study. Financing of the study (US\$200,000) was provided from funds under Loan 2114-MOR (Oil Shale Engineering). A draft final report was reviewed in May 1984 by CdM and the Bank. The report presented a satisfactory plan for the modernization/expansion of the mine and demonstrated the financial and economic viability of the project. At the request of CdM and the Bank, relatively minor refinements and additions were made, basically to define more clearly the correlation between timing of proposed drillholes and mine development work as well as the technical assistance requirements of CdM for project implementation. The project was appraised in July 1984.

B. Project Objectives

5.04 The overall project objectives are:

- (i) to reduce the country's balance of payments deficit by reducing oil imports through substitution by a competitive local energy resource;
- (ii) to secure continued employment in a less developed region by modernizing the production facilities and increasing their efficiency; and
- (iii) to maintain an appropriate coal pricing policy.

These objectives are fully consistent with the country's overall economic strategy as well as with the Bank's regional and industrial strategies.

5.05 At the company level the project has the following specific objectives:

- (i) to expand the production capacity of Siege V to 1.0 million tons per year in line with existing demand and geological/technical constraints of the mine;
- (ii) to simplify the network of galleries and shafts for increased productivity and production capacity;
- (iii) to improve safety, health and working conditions, mainly through better ventilation and the partial introduction of more mechanized working methods; and
- (iv) to improve CdM's organization and mine planning capabilities.

C. Project Description

5.06 The project consists of the following major components (Annex 5-1):

- (i) a drilling program to prepare underground development work and shaft sinking for the Siege V mine;
- (ii) underground development work in the Siege V mine to prepare future mining areas and to simplify existing mining areas;
- (iii) sinking of a new vertical shaft in the west of Siege V mine to maintain the production capacity after depletion of CdM's smaller mines;
- (iv) installation of underground equipment to increase efficiency, production capacity and to improve safety and health conditions in the Siege V mine;
- (v) installation of surface equipment to secure adequate coal cleaning, as well as supply of power and compressed air to the Siege V mine; and
- (vi) technical assistance to support CdM in the implementation of the above tasks.

The following paragraphs describe these components in more detail and the environmental, safety and health aspects of the project are also discussed.

(i) Drilling Program

5.07 The drilling program consists of about 25 shallow (up to 500 m) boreholes and up to 15 deep (up to 1,000 m) boreholes in the eastern portion of the Jerada coal basin, where all works under the project will be executed. The shallow holes will help confirm the correct location of the planned underground galleries and future mining areas. The deep holes are mainly intended for the confirmation of the reserves for the new shaft as well as its exact positioning. A few deep holes will also be needed to confirm the location of deep underground workings. The holes will predominantly be drilled at full diameter. Only about 15%, in the vicinity of coal seams, will be cored. The cores will be evaluated and the holes electrically logged. Correlations will be made with existing information from underground workings and previous drilling. Not all the holes will have to be completed before underground work under the project starts. Some urgent works in well explored ground have already started. One deep hole is directly allocated to the shaft sinking component.

(ii) Underground Development Work

5.08 The underground development work consists of the driving of about 14 km of galleries and inclines. A general breakdown of this work is presented in the table below:

CdM - Underground Development Work
(km)

	<u>Preparation of Future Mining Areas</u>		<u>Simplification of Existing Mine</u>	<u>TOTAL</u>
	<u>Northeast Siege V</u>	<u>Center Siege V</u>	<u>South Siege V</u>	
Galleries	0.4	3.8	3.8	8.0
Inclines	0.8	4.0	1.2	6.0
Total	<u>1.2</u>	<u>7.8</u>	<u>5.0</u>	<u>14.0</u>

Galleries and inclines will have cross sections ranging from 8 to 16 m², depending on their functions. The advancing method will be conventional: drilling, blasting and loading with scraper or side dump loaders, mainly for conveyor transport with occasional intermediate rail transport. Roof support will be by steel arches set at an average distance of 0.7 m with an average weight of 350 kg/m of gallery. About 5,000 tons of steel arches will be needed in total. Annual plans for the sequencing of the underground development work and its correlation with the depletion of the Bassin Nord and Siege IV as well as the production increase of Siege V mine have been prepared by BME.

(iii) Sinking of the New Vertical Shaft

5.09 The new vertical Shaft no. 3 will be sunk to the northwest of the present exploitation area of Siege V (Map IBRD 18453). It will be about 900 m deep and have a usable diameter of about 5.5 m. It will be equipped with the necessary lining, shaft winders, surface installations, electricity supply and railway connection. From the bottom portion of the shaft, main galleries will be driven towards the exploitation area. The purpose of the shaft is to provide additional ventilation (air entry) to the mine and to shorten access for material and personnel for future mine workings in the central section of Siege V, which will have to be developed before the Siege IV mine is depleted. In the long term, this shaft may also be used as an additional outlet for coal production and provisions will be made during its construction for that purpose. The location of the shaft will be in the center of the coal basin, about 3 km northwest of the existing Shaft 2 and the mouth of the main incline V, through which all mine production presently is hauled. Subject to confirmation by the deep drillholes, the shaft will be sunk in a basaltic dyke. The shaft will allow the extraction of about 15 million tons of coal reserves before another new shaft has to be sunk further to the west. Under terms of reference agreed with the Bank, BME will carry out the detailed engineering of all works connected with the sinking of Shaft no. 3. The cost estimates for this component include one deep bore hole directly related to sinking of the shaft (para. 5.07), detailed engineering studies (to be carried out under the contract with BME - para. 5.14) and about 2.5km of access galleries, to be executed by CdM and requiring an additional 1,300 tons of steel arches (para. 5.08). Assurances were obtained during negotiations, that construction of the shaft will be carried out only if and to the

extent the Bank shall (a) have been furnished with a report on the results of the drilling program and the engineering studies as well as with a proposed program of works, and (b) have approved this program of works and so notified CdM.

(iv) Installation of Underground Equipment

5.10 Underground equipment will be installed to mechanize some of the most arduous tasks for mine workers, increase the efficiency of underground transportation, and improve ventilation of underground workings and safety and health standards. Recognizing the technical and economic constraints of mechanizing thin seam mining, CdM has restricted the mechanization program to (i) the winning of coal by plough from only four additional longwall faces, a method already well proven at Jerada but with limited applicability due to the mine's geological conditions, and (ii) the trial operation of a small tunneling machine and a coal shearer with mechanized support in a suitable seam section.

5.11 The equipment to be installed comprises in particular:

- equipment for underground mechanization, consisting of 4 coal ploughs with steel conveyors, individual hydraulic props and related electrical equipment, 1 lightweight tunneling machine for galleries following a coal seam, and 1 shearer together with self-advancing hydraulic roof support.
- equipment for mechanization and modernization of transport consisting of about 5 monorail installations, 3.5 km conveyors, 2 chairlifts for personnel transport in inclines, 2 skips and 300 containers for material transport in inclines and 2 underground locomotives with 450 cars and 3 km of rail;
- about 5 principal and 25 auxiliary ventilators for improvement of ventilation; and
- safety and health equipment mainly consisting of fire and dust-fighting equipment and respirators.

(v) Surface Investments

5.12 The improvements to the washing plant consist of the installation of a 1,200 ton capacity raw coal bin, an additional coal screening station for fine coal and a 2 km long conveyor to the waste dump. These investments will allow the washing of fine coal of 3-6 mm size and thus assure that ash limits of the power plant will not be exceeded.

(vi) Auxiliary Investments

5.13 The improvements of power and compressed air supply consist of reinforcing electric distribution lines with installation of related switchgear and instrumentation, and addition of a new 1,200 kW compressed air station. Both of these components also contain some underground work for installation of cables and piping.

(vii) Technical Assistance

5.14 Cdm and BME signed in January 1985 a technical assistance contract. The technical assistance program covered by this contract is based on the completed feasibility study and will provide Cdm with services for follow-up, engineering and staff training required for project implementation and strengthening of Cdm's organization and operational and planning capabilities. This program includes some 200 man-months of consulting services. In particular, the following areas will be covered:

- follow up on the implementation of the proposed mine development plan and continuous monitoring of its refinement and improvement during the project completion period. Two senior mine planning engineers of BME together with Cdm staff will review on site semi-annually the progress in mine development and work out modifications to the annual and 5-year development plans. This is expected to enhance considerably CdMs planning capabilities;
- detailed studies, implementation plans and engineering to assist Cdm staff in the execution of project components which require special expertise not available at Jerada. Such areas are in particular the sinking of Shaft no. 3, the new underground transportation and mine ventilation systems, the operation of the longwall shearer and the tunneling machine; and the preparation of technical specifications for bid invitations as well as evaluation of bids;
- training of Cdm staff, in particular on-the-job training for key underground managerial staff and training for important functions such as time analysis and preparation of underground works.

(viii) Safety, Health and Environment

5.15 Substantial improvements in working conditions and safety are expected through better ventilation underground, which will increase airflow rates, reduce dust levels and temperature. Further improvements are expected from the simplified network of galleries with more efficient transportation facilities of high safety standard. As a result, occupational diseases and accident rates are expected to decrease. Installation of fire and dust fighting equipment is a specific sub-component of underground equipment. Furthermore, the installation of new underground cables will also reduce the fire risk. Assurances were obtained during negotiations that Cdm will carry out the Project and operate and maintain its mining facilities, in accordance with health and occupational safety standards acceptable to the Bank. Minimum standards would be those set forth in the International Labor Organization Codes of Practice on Prevention of Accidents, due to Fire, Electricity, Explosions. Moreover, Cdm would select appropriate assignments in low risk areas for workers suffering from early stages of silicosis, and would take measures to minimize workers' exposure to dust.

5.16 The project has no adverse effect on the environment. Once hauled to the surface, the increased coal production will be handled satisfactorily by existing installations. A new waste dump will improve the disposal of shale from the washing plant. The new Shaft no. 3 is located on wasteland and is non-pollutant insofar as it is, at least for the medium term, an air intake shaft without coal production.

D. Project Implementation and Schedule

5.17 Jerada's General Manager is the overall project manager who will delegate responsibility for the execution of the different project components to the appropriate departments within the Jerada organization. Coordination of the project execution and follow-up on time schedules will be the task of the Project Coordinator (para 4.21). The monitoring of mine development will be the responsibility of the Planning Manager (para. 4.21 and Annex 4-1). He will closely liaise with other managers, in particular the line managers for coal production in the Siege V mine and for mine development, who will be responsible for executing the work. CdM personnel has considerable experience in driving of underground galleries and inclines, installation of equipment, laying of pipes and cables and construction of buildings. The project components for which CdM has no implementation capabilities, the construction of Shaft no. 3 and the drilling and logging of boreholes and the improvements to the washing plant will be contracted. For procurement, CdM will use its existing, competent procurement unit in the Rabat office, assisted by technical experts from BME for preparation of technical specifications and bid evaluation. Close liaison with the executing units at Jerada will be assured by the Project Coordinator. In case of conflict between planning, procurement and executing agencies the General Manager in his capacity as highest project authority will intervene. He is well informed about all components of the project and has a keen interest in following project progress. Assurances were obtained during negotiations that CdM will carry out the project in accordance with implementation arrangements acceptable to the Bank.

5.18 Mine development work which has been suggested by BME for 1984 is in progress and on schedule. Project completion is scheduled for December 1990. A detailed time schedule comprising all major project components is presented in Annex 5-1. Historically, the Government has assisted CdM in maintaining schedules by timely approval of procurement documents. Moreover, under current arrangements CdM has assigned to it a nearly full-time financial controller. Thus no undue delays are anticipated in project implementation as a result of Government approval procedures for procurement.

E. Reporting Requirements

5.19 Assurances were obtained during negotiations from CdM that it will submit to the Bank quarterly and annual project progress reports in form and substance acceptable to the Bank. The quarterly report will contain a listing of the project tasks achieved during the reporting period and actual project expenditures, information on the project's and CdM financial status and changes to the implementation schedule. It will also

contain tables and bar charts for procurement, mine development and production, which allow a comparison with the original plan. In addition, the annual report will contain an updated 5-year mining plan as well as a revised annual mining plan for the period ahead. To this extent, the annual report will include a set of drawings for different seams and mining areas, showing completed as well as still to be executed galleries and incline sections and their correlations with the production plan. These documents will be prepared after the regular annual review of the plans by BME. The annual report will also contain a revised project cost estimate and a report on progress in safety and health provisions. The first quarterly report is expected to be completed for the period January-March 1985 and the first annual report for the period January-December 1985.

VI. PROJECT COSTS, FINANCING AND PROCUREMENT

A. Capital Cost

6.01 Total project costs are estimated at US\$71.7 million, of which the foreign exchange element is US\$47.5 million (66%). About 40% of the project cost can be attributed to maintaining the present production level over the next 5 years, 20% to increase the production rate to 1 million tpy during that period and 40% to maintain the new production rate after project implementation. Project costs by component are shown in the following table. A detailed calculation is available in the Project File.

	<u>Project Cost Estimate</u>						<u>%</u>	
	<u>(DM million)</u>			<u>(US\$ million)</u>			<u>%</u>	<u>Total</u>
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Exchange</u>	<u>Base Costs</u>
A. Shaft 3	52.8	92.8	145.6	5.6	9.8	15.4	64	30
B. Underground Works	67.8	14.0	81.8	7.1	1.5	8.6	17	17
C. Exploration Drilling	12.3	21.5	33.8	1.3	2.3	3.6	64	7
D. Underground Equipment	17.4	137.1	154.5	1.8	14.4	16.2	89	32
E. Surface Investments	5.4	22.4	27.8	0.6	2.4	3.0	80	6
F. Auxiliary Investments	3.3	25.7	29.0	0.3	2.7	3.0	89	6
G. Technical Assistance	3.7	13.8	17.5	0.4	1.4	1.8	79	4
Total Base Costs	162.7	327.3	490.0	17.1	34.5	51.6	67	100
Physical Contingencies	20.2	33.5	53.7	2.1	3.5	5.6	62	11
Price Contingencies	47.3	89.8	137.1	5.0	9.5	14.5	66	28
Total Project Costs	230.2	450.6	680.8	24.2	47.5	71.7	66	139
Increase in Working Capital	5.0	17.0	22.0	0.5	1.8	2.3	80	4
Total Financing Required	235.2	467.6	702.8	24.7	49.3	74.0	67	143

6.02 The base costs were estimated by BME and reviewed by the Bank and are expressed in December 1984 terms. For equipment supplies BME used the quantities and specification of their feasibility study. Price quotations were obtained from equipment suppliers and compared to recent supplies of similar equipment to European coal mines. Appropriate adjustments were made for delivery to Morocco. Spare parts (generally 10%) and provisions for installation, mostly local, were added where appropriate. For the construction of Shaft no. 3, budget price quotations were obtained from shaft sinking firms and comparison was made to the latest executed shaft sinking projects in Belgium with allowances for Moroccan conditions. The costs for drilling were estimated on the basis of existing contracts with BRPM for the shallow holes and a Swiss contractor's bid for the deep drilling and electrical logging. For other smaller work contracts such as improvements to the coal washing plant estimates are based on international quotations as well as BME's and CdM's recent experience. The costs for technical assistance are based on an estimate of 200 man-months in accordance with rates previously negotiated between CdM and BME. Physical contingencies have been estimated at 20% for the construction of Shaft no.3, 10% for other works contracts and 5% for equipment. In view of the good quality of the feasibility study these contingencies are considered adequate. Price contingencies have been estimated on the following basis: (i) for foreign cost 8% in 1985, 9% annually from 1986 to 1989 and 7.5% in 1990, and (ii) for local cost 10% in 1985 and 8% annually thereafter.

B. Financing

6.03 The total financing required is US\$74.0 million of which US\$49.3 million (67%) is in foreign exchange and US\$24.7 million in local currency. There is no additional financing of interest during construction as interest will not be capitalized by CdM. The interest due for the project-related loans will be paid out of the cash generated by CdM's operations, like other financial charges on existing debt.

6.04 Financing of foreign cost (except working capital) will be provided by bilateral and Bank loans on a parallel co-financing basis. Local cost, including taxes and duties, as well as incremental working capital will be financed by CdM's own cash generation. The financing plan is shown below:

	<u>Financing Plan</u>				
	<u>(US\$ million)</u>				
	<u>External</u>			<u>Internal</u>	
	<u>IBRD</u>	<u>KfW</u>	<u>France</u>	<u>CdM</u>	<u>Total</u>
Foreign	27.0	12.9	7.6	1.8	49.3
Local <u>a/</u>	—	—	—	24.7	24.7
Total	27.0	12.9	7.6	26.5	74.0

a/ Includes US\$2.2 million in taxes and duties.

6.05 Bilateral financing for equipment for underground mechanization and the conveyor for waste disposal would be provided by KfW of the Federal Republic of Germany to the Moroccan Government at their standard country terms which presently are: 2% p.a. interest and 30 year maturity, including a 10 year grace period. The total German financing provided is expected to amount to DM40 million (US\$ 12.9 million equivalent). The proceeds would be onlent to CdM at 6% p.a. interest and 15 year maturity, including a 4 year grace period. German manufacturers of the equipment to be financed have a large experience in the international market, and competition among them is expected to be good. Conditions of cross-default will be that (i) the KfW loan agreement shall not have been concluded by December 31, 1985, or (ii) that it shall not have become effective or the conditions precedent to disbursement shall not have been met by March 31, 1986.

6.06 Bilateral French financing under a Protocol is estimated to amount to about FF72 million (US\$7.6 million equivalent). This financing in the form of a mixed credit (approximately 40% as a Treasury loan with a 25-year maturity, including a 10-year grace period and 3% p.a. interest and 60% in Export Credits with 10 year maturity and 12% p.a. interest) would apply to selected equipment for transport, ventilation and electrical distribution, for safety and health equipment, and the raw coal bin. The financing plan was reviewed during negotiations and found satisfactory. It will be a condition of effectiveness of the Bank loan that the French financing shall have been secured. It will be a condition of cross-default that the French financing agreement shall not have become effective or the conditions precedent to disbursement shall not have been met by June 30, 1987.

6.07 The proposed Bank loan would be made to CdM, with the Government guarantee at the Bank standard variable interest rate and 15-year maturity tailored to the project life, including a 4-year grace period. There will be a commitment charge of 0.75% for undisbursed loan amounts. In addition CdM would pay as a guarantee fee to the Government 1.0% of the outstanding loan balance and would bear the foreign exchange risk. The table below summarizes the allocation of the different financing sources.

Financing Plan by Project Components
(US\$ million)

	<u>IBRD</u>	<u>KfW</u>	<u>France</u>	<u>GM</u>	<u>Total</u>		<u>Foreign</u>	<u>Local</u>	<u>Duties</u>
					<u>X</u>		<u>Exchange</u>	<u>(excl. taxes)</u>	<u>and Taxes</u>
A. Shaft 3	16.7	-	-	9.5	26.2	36	16.6	8.8	0.7
B. Underground Works	1.9	-	-	9.3	11.2	15	1.9	9.1	0.1
C. Exploration	2.7	-	0.3	1.6	4.6	6	3.0	1.6	0.0
D. Underground Equipment	1.6	11.8	4.5	2.3	20.2	27	17.9	1.2	1.1
E. Surface Investments	0.6	1.1	1.2	0.7	3.7	5	2.9	0.6	0.2
F. Auxiliary Investments	1.6	-	1.6	0.4	3.6	5	3.2	0.2	0.2
G. Technical Assistance	1.8	-	-	0.5	2.3	3	1.8	0.5	-
H. Working Capital Increase	-	-	-	2.3	2.3	3	1.8	0.5	-
Total Disbursements	27.0	12.9	7.6	26.5	74.0	100	49.3	22.5	2.2

C. Procurement

6.08 An overview of foreign procurement is given in the table below. There are about 12 packages to be financed by the Bank and procured in accordance with the Bank's Guidelines. Prequalification will be required for work contracts for the sinking of Shaft no. 3. ICB will be applied to all Bank contracts exceeding US\$300,000 equivalent. LIB will be applied to all other Bank financed contracts, up to an aggregate amount of US\$1.0 million equivalent (4% of the Bank loan). These latter contracts will be awarded on the basis of evaluation of bids invited from at least three qualified suppliers, each from a different country. BME, which had been selected to carry out the feasibility study, has been retained by CDM to provide the technical assistance required. In view of BME's unique qualifications and experience in thin seam coal mining, their selection is considered appropriate and consistent with the Bank's guidelines for the use of consultants.

Foreign Procurement
(US\$ million)

	<u>IBRD</u>			<u>Bilateral Aid</u>		<u>Total</u>
	<u>ICB</u>	<u>LIB</u>	<u>Other</u>	<u>KfW</u>	<u>France</u>	
Works contracts	11.3	-	-	-	1.2	12.5
Equipment supplies	12.7	1.0	-	12.9	6.4	33.0
Technical assistance	-	-	2.0	-	-	2.0
Total	24.0	1.0	2.0	12.9	7.6	47.5 a/

a/ Excluding working capital.

6.09 Bidding documents for 2 equipment packages totalling about US\$4.0 million have been reviewed by the Bank at negotiations (Annex 6-1).

Another package (drilling contract) amounting to about US\$3.0 million, would follow during the calendar year 1985 and most of the remaining equipment packages in 1986. The prequalification procedure for the major shaft construction contracts will be initiated in mid-1986 after sufficient engineering detail has been worked out by BME. Prior to bid invitation, all bidding documents for ICB-procured equipment and works will be reviewed by the Bank (total value, including contingencies, about US\$23.9 million or 89% of Bank loan). LIB-procurement packages (US\$1.0 million or 4% of Bank loan) would be subject to post review by the Bank.

6.10 The non-IBRD financed equipment supplies and works contracts will be procured in accordance with France's and KFW's procurement rules. The contract for shallow drilling has been awarded to BRPM. The other items financed by CdM consist mainly of direct force account work. The few remaining CdM-financed contracts for equipments supplies and works will be procured in accordance with local rules, which are satisfactory to the Bank.

D. Disbursement

6.11 An amount of up to US\$2.5 million will be made available for retroactive financing of expenses incurred after July 31, 1984 for the technical assistance contract and drilling of deep boreholes. Disbursements will be made from the different categories of the proposed Bank loan and in the percentages shown below:

<u>Allocation of IBRD Loan</u> (US\$ million)		
<u>Category</u>	<u>Amount</u>	<u>% of Expenditures to be Financed</u>
(1) Equipment for galleries, inclines and Shaft no. 3; and underground and surface equipment.	11.8	100% of foreign expenditures
(2) Works related to the construction of Shaft no. 3, drilling of deep holes, and construction of surface facilities.	10.6	95% of total expenditures
(3) Consultants' services to assist CdM in mine planning, project implementation and training.	1.9	100% of foreign expenditures
(4) Unallocated	<u>2.7</u>	—
Total	<u>27.0</u>	

6.12 The disbursement schedule (Annex 6-2) has been prepared in line with BME's planning and on the basis of the following payment schedule:
 (a) 15% at the time of placement of order; (b) 75% at delivery; and (c) 10%

after acceptance by Cdm. A summary of the disbursement schedule is presented below:

Disbursement of IBRD Loan
(in US\$ million)

<u>IBRD FY</u>	<u>FY86</u>	<u>FY87</u>	<u>FY88</u>	<u>FY89</u>	<u>FY90</u>	<u>FY91</u>
Annual	2.5	4.0	7.0	7.0	5.5	1.0
Cumulative	2.5	6.5	13.5	20.5	26.0	27.0

The disbursement profile differs from the normal country and industry profiles insofar as annual disbursements are expected to be relatively evenly distributed. This is explained by the project implementation schedule and Cdm's familiarity with similar procurement. Disbursement for Shaft no. 3 will be conditional upon Bank approval of the work program for sinking of that shaft.

VII. FINANCIAL ANALYSIS

A. Financial Projections

7.01 Cdm's financial prospects are discussed below in the context of basic assumptions required for preparing the financial projections for the Company. These refer to production build-up, the structure of production costs and coal prices. Detailed assumptions are provided in Annex 7-1.

7.02 The production build-up is based on the results of the 5-year mine plan prepared by BME and Cdm and reviewed by the Bank. The forecast is considered to be reasonable in that production for 1985 will remain at their 1984 level (800,000 t) and will gradually increase to 1,000,000 tons by 1988 with the installation of additional longwall faces in newly developed mine areas which will allow higher productivity through longer face lengths and better transportation and ventilation conditions. The sales volume forecasts are based on the market analysis developed in para. 3.07, and are expected to prevail as some 85% of Cdm's production will go to two customers, ONE and CIOR, close to the mine.

7.03 Cdm's production costs are expected to decrease in 1984 constant terms by about 9% over the period 1984-89, i.e., from an estimated DH 442/t (US\$51/t) in 1984 to DH 404/t (US\$47/t) in 1989 as shown in the table below. This decrease is primarily due to the expected increase in productivity from 800 kg/manshift in 1984 to 1,050 kg/manshift in 1989.

CdM - Production Unit Costs Summary
(1984 terms)

	1984			1989		
	<u>DH/t</u>	<u>US\$/t</u>	<u>%</u>	<u>DH/t</u>	<u>US\$/t</u>	<u>%</u>
Labor	189.4	21.9	43	158.8	18.4	39
Consumables	70.6	8.2	16	74.0	8.6	18
Power and Transport	54.0	6.2	12	61.0	7.0	15
Others	<u>20.0</u>	<u>2.3</u>	<u>5</u>	<u>17.8</u>	<u>2.0</u>	<u>4</u>
Total Operating Costs	<u>334.0</u>	<u>38.6</u>	<u>76</u>	<u>311.6</u>	<u>36.0</u>	<u>77</u>
Depreciation						
Existing Assets	90.0	10.4	20	12.4	1.4	3
Project Related	-	-	-	54.4	6.3	14
Interest						
Existing	18.0	2.0	4	1.2	0.1	-
Project Related	<u>-</u>	<u>-</u>	<u>-</u>	<u>24.0</u>	<u>2.8</u>	<u>6</u>
TOTAL	<u>442.0</u>	<u>51.0</u>	<u>100</u>	<u>403.6</u>	<u>46.6</u>	<u>100</u>

By 1989 most of the existing assets will have been depreciated and the bulk of depreciation (81%) will come from the new investments. Similarly interest expense will be mostly for loans contracted during the period (97%). Major changes in absolute terms are expected for labor costs (16% decrease, due to the increased production and productivity) and financial charges (45% increase). Power and transport costs are expected to increase by 13% mainly because of assumed yearly increases between 3% and 5% of real power tariffs which are partly offset by productivity gains. Consumables will go up by 5% due to the mechanization program, while provisions for health (included in others) will go down by 12% because of the expected improvements in health and safety.

7.04 The average realized coal price for 1984 (domestic and export) was DH 500/t (US\$58/t). For 1985 this average price is expected to reach DH 515/t (US\$54/t at current exchange rate). Domestic prices have been assumed to increase by 7.7% in nominal terms until 1990 and by 6.0% afterwards. This implies a slight decrease in real terms over the 1985-90 period and constant in real terms thereafter. Export prices are assumed to stay constant in real terms as they concern good quality anthracite. Average coal prices in current terms are projected as follows:

CdM - Projected Average Coal Price
(DH/ton - current terms)

	<u>Domestic</u>	<u>Export</u>	<u>Average</u>
1985	489	850	515
1986	527	927	590
1987	567	1,010	598
1988	611	1,101	645
1989	658	1,183	695
1990	708	1,254	747

7.05 Based on these main assumptions, financial projections have been prepared for CdM and are shown in Annexes 7-2 through 7-6. The key financial indicators are summarized in the following table.

CdM - Summary of Financial Projections
(DH million in current terms)

<u>Year ending December 31,</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
Production and Sales (000 tons)	800	850	925	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Sales Revenue	411.5	471.8	553.3	645.0	694.5	746.6	791.4	838.9	889.2	942.6
Other Revenue	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Operating Expenses	378.1	423.3	478.2	526.6	554.0	590.6	630.0	674.7	725.0	780.6
Operating Income	37.4	52.5	79.1	122.4	145.7	162.5	168.0	171.0	171.1	169.1
Net Income	-	-								
Internal Cash Generation	108.2	134.8	155.1	172.8	175.0	181.8	182.1	181.7	181.8	182.0
Investments	95.4	216.3	197.1	121.8	161.0	138.5	80.2	94.2	90.7	96.4
Total Debt Service	32.6	36.6	40.3	41.4	77.7	79.7	78.3	74.7	71.0	65.4
Net Fixed Assets	276.3	410.3	511.2	534.6	608.1	661.8	659.0	670.3	676.2	684.9
Total Current Assets	97.7	120.1	157.4	212.9	225.9	237.6	263.5	278.8	301.6	324.6
Total Current Liabilities	42.6	41.2	41.0	78.0	80.6	83.1	85.5	87.9	88.6	91.0
Total LTD	149.6	268.3	369.0	362.7	388.5	385.9	337.7	289.6	243.5	201.7
Total Equity	162.4	162.4	182.5	230.6	288.7	354.2	423.2	495.5	569.6	644.5
Ratios										
Net Income/Revenue	-	-	3.6	7.4	8.3	8.7	8.6	8.5	8.3	7.9
Debt Service Coverage	3.3	3.7	3.9	4.2	2.3	2.3	2.3	2.4	2.6	2.8
Long-Term Debt/Equity	48:52	62:38	67:33	61:39	57:43	52:48	44:56	37:63	30:70	24:76
Current Ratio	2.3	2.9	3.8	2.7	2.8	2.9	3.1	3.2	3.4	3.6
Quick Ratio	1.3	1.8	2.6	2.0	2.1	2.1	2.3	2.3	2.5	2.7

a/ Zero in the first two years due to deferred depreciation.

The increase in production coupled with an increase in productivity would have a substantial impact on CdM's earnings. Because of deferred depreciation amounting to DH 86.2 million in 1984, net income would be zero during both 1985 and 1986 and would increase rapidly afterwards. With

substantial investments in the first five years, net fixed assets increase quickly over this period. The net income/sales ratio develops favorably from 0% to about 9%. Debt service coverage is satisfactory with a ratio of 3.3 in 1985 and fluctuating thereafter between 2.3 and 4.2. The current ratio increases from 2.3 to 3.6 over the period principally because of accumulating cash surpluses while the long-term debt/equity ratio, after deteriorating through the first three years, improves constantly thereafter since CdM is not assumed to contract new loans after 1989.

B. Financial Covenants

7.06 Profitability, creditworthiness and a sufficient cash flow are essential elements in CdM's future performance and its capability to carry out the Project as scheduled and to manage operations efficiently. A period of new financial difficulties with accumulating debts and dependency on Government subsidies could result in actual bankruptcy and cut off the only source of internal coal supply in Morocco. It is therefore essential that the financial health of CdM be assured as long as this is feasible under competitive conditions. Since the major factor in past financial problems of CdM has been an inadequate coal pricing policy this should therefore represent a major policy covenant (para. 3.06). In addition, the Bank should ascertain that beyond the scope of the Project, CdM does not make any decision which could jeopardize its capability of complying with obligations to service the debt linked to the Project or of carrying out its operations with an adequate liquidity basis. Therefore, assurances were obtained from CdM at negotiations on the following covenants:

- (i) CdM will maintain a long term debt/equity ratio of no more than 67:33 until January 1, 1991 and 50:50 afterwards;
- (ii) CdM will not incur any debt which would cause its debt service coverage ratio to be less than 1.5. CdM would also submit not later than November, 30 of each year its proposed program of capital expenditures for the Bank's review; and thereafter carry out only the program of capital expenditures as agreed with the Bank; and
- (iii) CdM will maintain at all times a current ratio of no less than 1.3.

C. Financial Rate of Return and Sensitivity Analysis

7.07 The financial rate of return has been calculated on the basis of incremental costs and benefits in 1984 real terms. These streams have been determined on the basis of a comparison of "with" and "without" project developments, whereby "without" project, in line with BME's feasibility study, reflects a gradual deterioration of mining activities with only minor replacement investment resulting in a production decrease from the current level of about 800,000 tons to 600,000 tons in 1990. The "with" Project developments are based on project investments and reinvestments of equipment and materials after the implementation period resulting in a production build-up from currently 800,000 tons to 1 million tons in 1988.

Production build up, costs, and prices assumptions have been defined in paras. 7.02, 7.03 and 7.04. All other major assumptions are found in Annex 7-7.

7.08 Under these assumptions the incremental financial rate of return is 24% before taxes and 16% after taxes.

Sensitivity Tests of Incremental Financial Rate of Return After Taxes (%)

Base Case	16
10% Decrease in sales revenues	11
10% Increase in capital costs	13
10% Increase in operating costs	14
18-mos. delay in project implementation	13

As could be expected, the rate of return is most sensitive to a 10% drop in revenues which could be the result of insufficient price adjustments. The price review mechanism (para. 3.06) has been designed to minimize this risk and assure CdM's financial viability. The rate of return is less sensitive to increases in operating costs which could occur if major cost items such as wages and prices or consumables rise more in real terms than assumed in the projections or if operations are managed less efficiently than estimated.

7.09 In addition to the incremental rate of return presented above, a rate of return on the investment considering all existing assets as sunk costs has been calculated. Based on the same assumptions this after-tax financial rate of return is 34%. This rate is higher because of the relatively limited investment required to continue producing and expand from 800,000 tpy to 1,000,000 tpy.

VIII. ECONOMIC ANALYSIS

8.01 The project is an important part of the Government's strategy for the energy sector. It would contribute to maintenance and increase of the the production potential of the Jerada coal mine, currently the only exploitable coal resource of the country represents a major economic activity in the Eastern region. Project implementation would result in modernization of the mine and thus increase production and productivity. Major benefits would include (i) contribution to the Government's program of energy substitution (coal for oil) with the objective of reducing electricity production costs and saving foreign exchange; (ii) promotion of local energy production for substitution against imported energy with the result of additional foreign exchange savings; (iii) effective utilization of the existing coal potential and the mine-mouth power plant and thus reduction of costs of electricity production; and (iv) maintenance of employment and economic infrastructure in a low potential area in eastern Morocco.

A. Economic Rate of Return

8.02 The incremental economic rate of return has been calculated on the basis of production scenarios, capital and operating costs used in the financial analysis with the following exceptions: (i) import duties and taxes were not taken into account; and (ii) a conversion factor of 0.8 was applied to all local labor costs since the Jerada coal mine represents one of few employment possibilities in the north-eastern border area and opportunity costs of labor are estimated to be lower than realized earnings at the mine.

8.03 Coal prices have been determined on the basis of import parity prices derived from recent forecasts for international coal prices. Although Jerada coal is anthracite, international steam coal prices have been used as comparator since most of the Jerada production consists of low quality fines, used for electricity generation. FOB prices were adjusted to take into account shipment sizes acceptable to Moroccan ports, and unloading, handling and interior transport costs. A constant CIF price of US\$45/ton has been used. Port handling and transport costs are estimated to remain constant in real terms over the period. Port handling has been taken at US\$7/t (1984 terms) and transport costs at US\$2.3/t km (rail) or US\$10/ton (truck) for transport from the west coast or the north coast respectively. Export prices for Jerada high quality anthracite are expected to remain constant throughout the period at US\$98/t (1984 terms FOB Moroccan port).

8.04 The coal production drop in the "without project" case would force ONE to switch to alternative, more costly primary energy for power generation. Since all Moroccan coal fired power stations are fully utilized to contribute to the base load^{6/} and hydropower is not suitable for base load supply, practically any shortfall in power generation from Jerada would have to be replaced by additional generation from existing oil fired stations with spare generation capacity. The most likely least cost electricity generation would then be from the new Mohammedia oil-fired units since the construction of a new power plant on the coast to replace Jerada would not be economically justified (para. 3.05). Due to the higher fuel cost, electricity production cost would be higher by about US\$1/kWh or 20% of cash cost. This has been reflected in the calculation of the opportunity cost for Jerada coal (Annexes 8-1 and 8-2). Under the assumptions summarized above, the economic rate of return for the base case has been calculated at 36% (Annex 8-3). The high value is principally due to the rehabilitation character of the project which provides necessary investments for an on-going concern with substantial existing infrastructure, personnel and experience. Sensitivity of the rate of return has been calculated for a decrease in coal sales, an increase in capital costs, and an increase in operating costs. The results of these sensitivity tests are summarized in the table below.

^{6/} Present base load is about 500 MW. Present coal based generation capacity (Jerada and Roche Noire) at 70% load factor is 158 MW, which will be increased to 368 MW after startup of the new Mohammedia units in 1985.

Sensitivity Tests of Incremental Economic Rate of Return (%)

	<u>ERR</u>
Base Case	36
10% Decrease in sales revenues	24
10% Increase in capital costs	30
10% Increase in operating costs	32
18-mos. delay in project implementation	30

B. Foreign Exchange Benefits

8.05 The foreign exchange benefits due to the project that would accrue to Morocco are substantial. The incremental export earnings would increase from US\$0.2 million in 1985 to US\$3 million by 1990, in 1984 terms. In addition foreign exchange savings due to the use of Jerada coal for both the cement and power sectors would stand at US\$27.0 million in 1984 terms by 1990. These additional earnings and savings would largely exceed the estimated US\$6 million in debt service, in 1984 terms, by 1990. As a result, total foreign exchange earnings and savings due to the project would after 1990 range around 4% of Morocco's average oil import expenditures in recent years.

C. Project Risks

8.06 The project carries geological, technical and economic risks that are prevalent in underground thin seam coal mining:

- (a) The geological risks are of two kinds: (i) lower mineable reserves than estimated and (ii) difficult geological conditions linked with the shaft sinking. While these risks, like in other mining projects, cannot be fully removed, they have been minimized by incorporating into the project a drilling program at the beginning which is designed to verify the continuity of geological conditions. Assurances were obtained to ensure that the drilling program is completed and evaluated before construction of Shaft no. 3 is started (para. 5.09). In addition, 20% contingency provisions have been made for the shaft construction.
- (b) The technical risks relate to the possibility of CdM not attaining the planned production build-up. These risks have been minimized by the defined reinforcement of CdM's organization and a well specified technical assistance program adapted to CdM's needs.
- (c) The economic and financial risks relate to the long-term competitiveness of Jerada coal vis-a-vis imported coal. As described earlier the comparative advantage of Jerada lies in its location close to its two main consumers (85% of production). Both for the Jerada power plant and the CIOR cement factory alternative fuels would be costlier than Jerada coal and this

trend is expected to prevail in the future. Marketing arrangements between CdM and ONE have therefore been entered into, and similar arrangements are expected to be concluded between CdM and CIOR (para. 3.07). Moreover, assurances were obtained at negotiations on implementation of a coal pricing policy in accordance with principles of opportunity cost pricing (para. 7.06).

IX. AGREEMENTS REACHED AND RECOMMENDATIONS

9.01 The following topics were reviewed during negotiations and found to be satisfactory:

- (i) the principal objectives of the Government's future energy policy, (para. 2.23); and
- (ii) the definitive financing plan for the project (para. 6.06).

9.02 During negotiations the following agreements were obtained:

(a) From the Government:

to adjust Jerada coal prices annually in line with the development of its opportunity cost (para. 3.06).

(b) From CdM

- (i) to provide yearly audited financial statements to the Bank (para. 4.25);
- (ii) not to start construction of Shaft no. 3 before the drilling program and the engineering are completed and have led to results acceptable to the Bank (para. 5.09);
- (iii) to carry out the project and maintain its mining facilities in accordance with health and occupational safety standards acceptable to the Bank (para. 5.15);
- (iv) to carry out the project in accordance with implementation arrangements acceptable to the Bank (para. 5.17);
- (v) to provide quarterly and annual project progress reports (para. 5.20); and
- (vi) to abide by the financial covenants presented in para. 7.06.

9.03 The following is a condition of effectiveness of the Bank loan:
that the French Protocol has been signed (para. 5.06).

9.04 The following are conditions of cross-default:

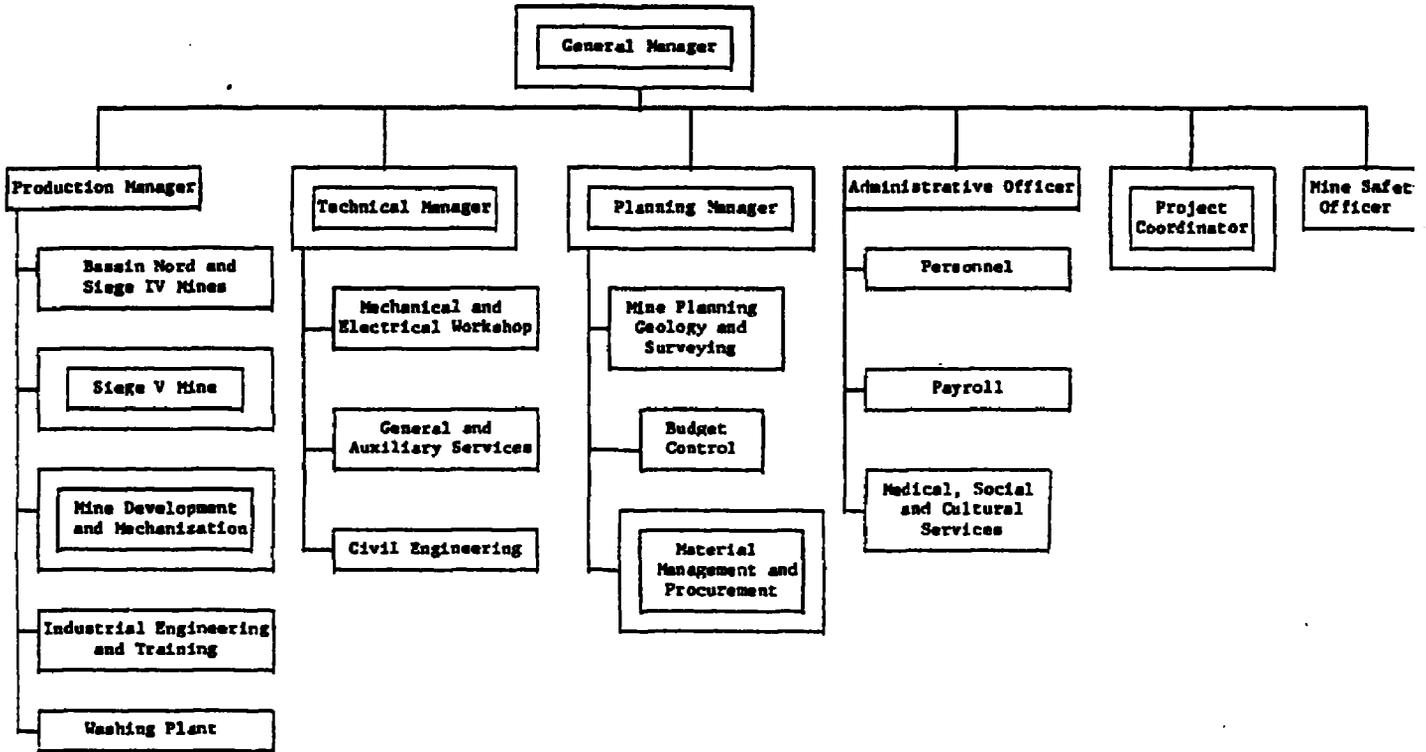
- (i) that the KfW loan agreement shall not have been concluded by December 31, 1985;
- (ii) that the KfW loan agreement shall not have become effective or the conditions precedent to disbursement shall not have been met by March 31, 1985; and
- (iii) that the French financing agreement shall not have become effective or the conditions precedent to disbursement shall not have been met by June 30, 1987.

9.05 The following is a condition of disbursement:

that disbursement for Shaft no. 3 will be conditional upon Bank approval of the work program for sinking the Shaft.

9.06 Given the preceding agreements and assurances, the Project is suitable for a Bank loan to CdM with the guarantee of the Government of Morocco, of US\$27.0 million equivalent for a period of 15 years, including four years' grace.

ORGANIZATION CHART FOR JERADA OPERATIONS



Legend: Positions with major role for project implementation

Industry Department
January 1985

MOROCCO: JERADA COAL MINE MODERNIZATION AND EXPANSION
CHARBONNAGES DU MAROC
Historical Financial Statements
(DH million)

	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u> ^{a/}
A. INCOME STATEMENT						
Production ('000 tons)	710	680	703	735	751	800
1. Sales Revenues	145.8	167.2	217.6	232.3	318.6	368.0
2. Operating Expenses	<u>130.9</u>	<u>144.8</u>	<u>165.1</u>	<u>208.0</u>	<u>257.1</u>	<u>259.5</u>
Operating Margin	<u>14.9</u>	<u>22.4</u>	<u>52.5</u>	<u>24.3</u>	<u>61.5</u>	<u>108.5</u>
3. Financial Charges	0.9	8.8	8.7	10.0	13.1	14.5
4. Provisions	1.8	6.0	6.8	10.7	8.2	12.0
5. Depreciation	<u>10.8</u>	<u>21.4</u>	<u>38.8</u>	<u>60.9</u> ^{b/}	<u>67.0</u> ^{c/}	<u>72.0</u>
Net Income	<u>1.4</u>	<u>(13.8)</u>	<u>(1.8)</u>	<u>(57.3)</u>	<u>(26.8)</u>	<u>10.0</u>
Net Profit (Profit and Loss Statement)	<u>0.7</u>	<u>(11.9)</u>	<u>(3.9)</u>	<u>3.3</u>	<u>-</u>	<u>10.0</u>
Ratio						
Operating Margin/Sales (%)	10.2	13.4	24.1	10.5	19.3	29.5
B. BALANCE SHEET						
I. ASSETS						
Net Fixed Assets	189.4	215.5	225.4	229.2	217.1	240.4
Deferred Depreciation	-	-	-	60.9	88.2	86.2
Other Fixed Assets	<u>10.6</u>	<u>8.2</u>	<u>4.9</u>	<u>6.0</u>	<u>6.6</u>	<u>11.4</u>
Total Fixed Assets	<u>200.0</u>	<u>223.7</u>	<u>230.3</u>	<u>296.1</u>	<u>301.9</u>	<u>338.0</u>
Inventories	39.6	36.2	32.9	36.2	51.7	54.7
Quick Assets	<u>36.7</u>	<u>25.8</u>	<u>43.9</u>	<u>59.8</u>	<u>83.4</u>	<u>83.4</u>
Total Current Assets	<u>76.3</u>	<u>62.0</u>	<u>76.8</u>	<u>96.0</u>	<u>135.1</u>	<u>138.1</u>
TOTAL ASSETS	<u>276.3</u>	<u>285.7</u>	<u>307.1</u>	<u>392.1</u>	<u>437.0</u>	<u>476.1</u>
II. LIABILITIES AND EQUITY						
Current Liabilities	105.6	122.4	153.5	192.4	79.0	76.5
Long-Term Debt	46.2	50.8	35.3	37.3	185.5	161.1
Provisions	31.7	31.6	36.3	62.1	67.1	76.1
Equity and Reserves	<u>92.8</u>	<u>80.9</u>	<u>82.0</u>	<u>100.3</u>	<u>105.4</u>	<u>162.4</u>
TOTAL LIABILITIES AND EQUITY	<u>276.3</u>	<u>285.7</u>	<u>307.1</u>	<u>392.1</u>	<u>437.0</u>	<u>476.1</u>
Ratios						
Quick Ratio	0.35	0.21	0.29	0.31	1.06	1.09
Current Ratio	0.72	0.51	0.50	0.50	1.71	1.81
Long-Term Debt/Total Capitalization	37:63	31:69	23:77	19:81	52:48	40:60

^{a/} Forecast as of October, 1984.

^{b/} Deferred Depreciation.

^{c/} Of which DH27.3 M have been deferred.

MOROCCO
JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT
Project Implementation Schedule

A. Summary

	1985				1986				1987				1988				1989				1990
	I	II	III	IV	I																
MAIN PROJECT COMPONENTS																					
1. Drilling																					
2. Underground Development																					
3. Construction of Shaft No. 3																					
4. Installation of Underground Equipment																					
5. Installation of Surface Equipment																					
6. Power Distribution & Air Supply																					
7. Technical Assistance																					

MOROCCO
JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT
Project Implementation Schedule

C. Installation of Major Equipment
(Placement of order to completion of installation)

	1985				1986				1987				1988				1989				
	I	II	III	IV																	
UNDERGROUND																					
(a) MECHANIZATION ^c																					
Focus with Ploughs (3 lots)																					
Focus with Shearer																					
Road Header																					
(b) TRANSPORTATION																					
Monorails (4 lots) ^b																					
Conveyors (4 lots)																					
Skips & Containers (4 lots) ^b																					
Chalfits (4 lots) ^b																					
Locomotives (3 lots) ^b																					
Cars & Rails ^v																					
(c) VENTILATION ^p																					
Main Ventilators (3 lots)																					
Secondary Ventilators (4 lots)																					
(d) POWER DISTRIBUTION ^b																					
Cables (2 lots)																					
Transformers (2 lots)																					
Switchgear (2 lots)																					
(e) COMPRESSED AIR																					
Compressors																					
Piping																					
SURFACE																					
Screening Station																					
Raw Coal Bin ²																					
Shale Conveyor ²																					

^a Financed by IWM.
^b Financed by the government of France
^c Works contract.

MOROCCO
JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT
Project Implementation Schedule

D. Technical Assistance

	1985				1986				1987				1988				1989			
	I	II	III	IV																
Training																				
Review Mining Plans	-																			
Engineering																				
- Transportation	-																			
- Ventilation	-																			
- Shaft No. 3	-																			
- Mechanization	-																			
Other Assistance (including procurement)	6 man months as needed				6 man months as needed				6 man months as needed				3 man months as needed				3 man months as needed			

Industry Department
November 1984

World Bank-26900

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

PROCUREMENT SCHEDULE

<u>I. EQUIPMENT</u>	<u>Quantity</u>	<u>Estimated Cost ^{a/} (US\$ million)</u>	<u>Bid Documents</u>	<u>Evaluation</u>	<u>Cont.</u>
A. KfW Financed					
1.0	Mechanization				
1.1	Coal Plough	4 units	3/85	7/85	10/85
1.2	Coal Shearer	1 unit	9/86	1/87	4/87
1.3	Self-Advancing Roof Support	1 lot	3/86	7/86	10/86
1.4	Single Prop. Roof Support	4 lots	4/85	8/85	11/85
1.5	Road Header Machine	1 unit	8/85	12/85	3/86
1.6	Auxiliaries	4 lots	3/85	7/85	10/85
	Subtotal	<u>11.8</u>			
2.0	Shale Conveyor	1 lot	2/86	6/86	9/86
	Total	<u>12.9</u>			
B. French Government Financed					
3.0	Transport Mechanization				
3.1	Monorails	4 units	2/85	6/85	9/85
3.2	Skips and Containers	4 lots	7/85	11/85	2/86
3.3	Chairlifts	2 units	2/85	6/85	9/85
3.4	Locomotives	3 units	7/85	11/85	2/86
3.5	Cars and Rails	3 lots	7/85	11/85	2/86
	Subtotal	<u>4.0</u>			
4.0	Ventilation				
4.1	Main Fans	5 units	8/85	2/85	3/86
4.2	Secondary Fans	25 units	8/85	12/85	3/86
	Subtotal	<u>0.2</u>			
5.0	Power Distribution				
5.1	Cables	2 lots	4/86	8/86	11/86
5.2	Transformers	2 lots	2/86	6/86	9/86
5.3	Switchgear	2 lots	2/86	6/86	9/86
	Subtotal	<u>1.6</u>			
6.0	Safety and Health				
6.1	Communication Equipment	2 lots	9/87	1/88	4/88
6.2	Dust Suppression Equipment	3 lots	8/85	12/85	3/86
6.3	Other	n.a.	n.a.	n.a.	n.a.
	Subtotal	<u>0.3</u>			
7.0	Research				
7.1	Underground Drills	3 units	4/86	8/86	11/86
7.2	Other	n.a.	n.a.	n.a.	n.a.
	Subtotal	<u>0.3</u>			
	Total	<u>6.4</u>			

a/ CIF foreign cost only, including contingencies.

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTPROCUREMENT SCHEDULE

<u>EQUIPMENT (cont'd)</u>	<u>Quantity</u>	<u>Estimated Cost ^{a/} (US\$ million)</u>	<u>Bid Documents</u>	<u>Evaluation</u>	<u>Contract</u>
C. <u>Bank Financed</u>					
8.0 Steel Arches <u>b/</u>	6,300 t	2.4	2/85	6/85	10/85
9.0 Conveyors <u>b/</u>	2,600 m	1.6	3/85	7/85	10/85
10.0 Compressed Air					
10.1 Compressors	3 units	1.3	6/86	10/86	1/87
10.2 Piping	2,600 m	0.2	6/86	10/86	1/87
Subtotal		<u>1.5</u>			
11.0 Screening Station	1 lot	0.6	2/86	6/86	9/86
12.0 Mobile Construction Equipment	1 lot	0.1	3/87	7/87	10/87
13.0 Surface Equipment Shaft No. 3					
13.1 Hoisting Machine	1 unit	4.7	8/88	12/88	3/89
13.2 Headgear	1 unit	2.0	6/88	10/88	1/89
13.3 Others	n.a.	0.9	n.a.	n.a.	n.a.
Subtotal		<u>7.5</u>			
Total		<u>13.8</u>			
II. <u>WORKS CONTRACTS</u>					
A. <u>French Government Financed</u>					
14.0 Raw Coal Bin	1 unit	<u>1.2</u>	9/86	1/87	4/87
Total		<u>1.2</u>			
B. <u>Bank Financed</u>					
15.0 Deep Drilling	15 holes	3.0	3/85	6/85	9/85
16.0 Construction Shaft No. 3					
16.1 Shaft Sinking	1 lot	7.0	3/86	7/86	10/86
16.2 Shaft Installations	1 lot	1.2	9/87	1/88	4/88
Subtotal		<u>8.2</u>			
Total		<u>11.2</u>			
III. <u>TECHNICAL ASSISTANCE</u>					
17.0 Contract with BME	n.a.	<u>2.0</u>	n.a.	n.a.	2/85
Total		<u>2.0</u>			

a/ CIF foreign cost only, including contingencies.

b/ Draft bidding documents reviewed by the Bank during negotiations.

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

DISBURSEMENT SCHEDULE FOR BANK LOAN
(US\$ million)

<u>Bank Fiscal</u> <u>Year</u>		<u>Semi-Annual Disbursements</u>		<u>Cumulative Disbursement</u>	
		<u>Amount</u>	<u>% Total</u>	<u>Amount</u>	<u>% Total</u>
1986	I	1.2	4	1.2	4
	II	1.3	5	2.5	9
1987	I	1.5	6	4.0	15
	II	2.5	9	6.5	24
1988	I	3.5	13	10.0	37
	II	3.5	13	13.5	50
1989	I	3.5	13	17.0	63
	II	3.5	13	20.5	76
1990	I	3.5	13	24.0	89
	II	2.0	7	26.0	96
1991	I	<u>1.0</u>	<u>4</u>	27.0	100
		27.0	100		

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

ASSUMPTIONS FOR FINANCIAL PROJECTIONS

A. Inflation

1. Domestic inflation has been assumed at 10% in 1985 and 8% p.a. thereafter, international inflation at 8% in 1985, 9% from 1986-1989, 7.5% in 1990 and at 6% thereafter. Coal prices have been assumed to grow at 7.7% annually until 1990 and at 6% thereafter.

B. Production

2. Production build-up has been assumed to follow the assessment of the feasibility study (Sales Forecasts).

C. Investments

3. In addition to project investments, the following capital expenditures have been taken into account: replacement, mine works after the project, and housing. The assumed depreciation periods are as follows:

<u>Investment Item</u>	<u>Depreciation Period (years)</u>
Shaft and incline 7	20
Galleries, boreholes, surface investments	10
Equipment	5
Housing	10

Inflation rates applied have been weighted in accordance with local and foreign currency shares. Existing fixed assets have been taken into account for depreciation on the basis of total annual depreciation as forecast by CdM.

D. Costs

4. The Income Statement shows the development of production costs. All elements of production costs have been estimated at their predicted 1984 values, escalated by 10% for the base year 1985, except for depreciation which was calculated in the Fixed Assets Schedule.

(a) Consumables: 22% were assumed independent and 78% dependent on production. These real values were added and adjusted by a weighted inflation rate for a 70% foreign and 30% local share.

(b) Labor: was assumed to remain unchanged in real terms. The 1985 base amount for wages and salaries was therefore escalated only by local inflation.

- (c) Power and utilities: 90% of the 1985 base amount was assumed independent and 10% dependent on production. Real tariff increases of 5% annually until 1989 and 3% annually thereafter have been assumed in line with the proposed strategy for the energy sector. The values in real terms thus calculated were escalated by local inflation.
- (d) Transport: 92% were assumed dependent and 8% independent from production. The real values were escalated by local inflation.
- (e) Taxes, administrative charges and provisions were assumed independent from production and their 1985 base values were escalated by the local inflation rate.
- (f) Income tax was calculated at 50% of net income before taxes.
- (g) Interest and fees: interest on existing debts has been taken into account. For the Bank loan the interest rate has been assumed at 9.29% p.a., the guarantee fee to the Government at 1% on the outstanding balance, and the commitment fee as 0.75% on average undisbursed amounts. Interest on the KfW loan has been defined as 6% with a commitment fee of 0.5% on undisbursed amounts. Interest on the French financing has been taken as 8% on the average. The interest payments have been calculated on average outstanding amounts in the middle of each year. Both for the Bank and for the KfW loan, grace periods of four years and total maturities (including grace) of 15 years have been assumed while the French financing has an average grace period of five years with an average maturity of 16 years.

E. Balance Sheet, Working Capital and Funds Flow

- (a) Current assets: Cash was defined as one half month of wages and salary payments, receivables as 12.5% of domestic sales of one year, inventories of consumables as 25% of consumable consumption in one year, coal inventories were considered constant in real terms with 50,000 tons valued at average coal prices.
- (b) Current liabilities: Payables were defined as 25% of consumable consumption in one year plus 17% of transport costs.
- (c) Fixed assets have been calculated in the Fixed Assets Schedule along with depreciation to determine net fixed assets.
- (d) Outstanding long-term debt has been calculated in the Loan Schedule and transferred to the balance sheet for existing and new debt along with the current portion which was included in current liabilities. In the Loan Schedule all different sources of existing and new long-term debt are listed in detail.

- (e) Other fixed assets, existing provisions, subscribed capital and Government equity have been assumed to remain unchanged in current terms. Retained earnings have been calculated as accumulated net income plus an initial amount of DH 2.1 million for existing reserves.
- (f) Deferred depreciation has been assumed to be written off by yearly amounts defined in the Income Statement.

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTCHARBONNAGES DU MAROCPROJECTED SALES FORECASTS
(DH millions - current terms)

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
<u>Production Volumes (000' tons)</u>										
Production of fines	640	680	740	800	800	800	800	800	800	800
Production of lumps 6/10	51	54	60	64	64	64	64	64	64	64
Production of lumps 10/30	69	73	80	86	86	86	86	86	86	86
Production of lumps 30/80	40	43	45	50	50	50	50	50	50	50
Total Production	<u>800</u>	<u>850</u>	<u>925</u>	<u>1000</u>						
<u>Sales Volumes (000' tons)</u>										
A. <u>Domestic</u>										
Sales of fines	640	679	740	800	800	800	800	800	800	800
Sales of lumps 6/10	51	55	60	65	65	65	65	65	65	65
Sales of lumps 10/30	44	47	51	56	56	56	56	56	56	56
Sales of lumps 30/80	9	9	9	9	9	9	9	9	9	9
Total Domestic Sales	<u>744</u>	<u>790</u>	<u>860</u>	<u>930</u>						
B. <u>Export</u>										
Export sales of lumps	56	60	65	70	70	70	70	70	70	70
C. <u>Total Sales</u>										
Total Sales	800	850	925	1000	1000	1000	1000	1000	1000	1000
<u>Coal Prices (DH/t)</u>										
A. <u>Domestic Prices</u>										
Price of fines	463	499	537	578	623	671	711	754	799	847
Price of lumps 6/10	629	677	730	786	846	911	966	1024	1086	1151
Price of lumps 10/30	658	709	763	822	885	953	1011	1071	1136	1204
Price of lumps 30/80	725	781	841	906	975	1051	1114	1180	1251	1326
Export Prices	850	927	1010	1101	1183	1254	1330	1409	1494	1584
<u>Sales Revenues</u>										
Domestic Sales Revenues	363.9	416.2	487.7	568.0	611.7	658.8	698.3	740.2	784.7	831.7
Export Sales Revenues	47.6	55.6	65.6	77.1	82.8	87.8	93.1	98.7	104.6	110.0
Total Sales Revenues	<u>411.5</u>	<u>471.8</u>	<u>553.3</u>	<u>645.0</u>	<u>694.5</u>	<u>746.6</u>	<u>791.4</u>	<u>838.9</u>	<u>889.2</u>	<u>942.6</u>

Industry Department
January 1985

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTCHARBONNAGES DU MAROCPROJECTED INCOME STATEMENT
(DH million - current terms)

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
<u>Revenues</u>										
Domestic sales revenues	363.9	416.2	487.7	568.0	611.7	658.8	698.3	740.2	784.7	831.7
Export sales revenues	47.6	55.6	65.6	77.1	84.0	90.3	95.7	101.4	107.5	114.0
Total sales revenues	411.5	471.8	553.3	645.0	695.7	749.1	794.0	841.7	892.2	945.7
Other revenues	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Revenues	415.5	475.8	557.3	649.0	699.7	753.1	798.0	845.7	896.2	949.7
<u>Operating Costs</u>										
Consumables	70.3	80.2	93.2	107.9	117.3	126.3	134.6	143.5	153.0	163.1
Labor	171.6	185.3	200.2	216.2	233.5	252.1	272.3	294.1	317.6	343.0
Taxes	1.6	1.8	1.9	2.1	2.2	2.4	2.6	2.8	3.1	3.3
Power and Utilities	35.1	42.0	51.4	62.6	71.0	79.0	87.9	97.7	108.7	121.0
Transport	11.1	12.7	14.8	17.2	18.6	20.1	21.7	23.4	25.3	27.3
Administration	3.3	3.6	3.8	4.2	4.5	4.8	5.2	5.7	6.1	6.6
Provisions	14.3	15.4	16.7	18.0	19.5	21.0	22.7	24.5	26.5	28.6
Depreciation	70.8	82.3	96.2	98.5	87.4	84.8	83.0	82.9	84.8	87.7
Total Operating Costs	378.1	423.3	478.2	526.6	554.0	590.6	630.0	674.7	725.0	780.6
Gross Income	37.4	52.5	79.1	122.4	145.7	162.5	168.0	171.0	171.1	169.1
Financial Charges	7.9	13.4	21.2	26.2	29.5	31.5	30.1	26.5	22.9	19.3
Deferred Depreciation	29.5	39.1	17.6	-	-	-	-	-	-	-
Pre-tax Income	-	-	40.3	96.2	116.2	131.0	137.9	144.6	148.3	149.8
Income Tax	-	-	20.1	48.1	58.1	65.5	69.0	72.3	74.1	74.9
Net Income	-	-	20.1	48.1	58.1	65.5	69.0	72.3	74.1	74.9
<u>RATIOS (%)</u>										
Gross Income/Revenue	9.0	11.0	14.2	18.9	20.8	21.5	21.1	20.2	19.1	17.8
Net Income/Revenue	-	-	3.6	7.4	8.3	8.7	8.6	8.5	8.3	7.9

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTCHARBONNAGES DU MAROCPROJECTED WORKING CAPITAL SCHEDULE
(DH million - current terms)

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
<u>Current Assets</u>										
Cash	7.1	7.7	8.3	9.0	9.7	10.5	11.3	12.3	13.2	14.3
Receivables	45.5	52.0	61.0	71.0	76.5	82.4	87.3	92.5	98.1	104.0
Inventory: Consumables	17.6	20.0	23.3	27.0	29.3	31.6	33.7	35.9	38.3	40.8
Inventory: Coal	<u>23.1</u>	<u>24.9</u>	<u>26.9</u>	<u>28.9</u>	<u>31.1</u>	<u>33.5</u>	<u>35.6</u>	<u>37.7</u>	<u>40.0</u>	<u>42.3</u>
Current Assets	93.4	104.7	119.5	135.9	146.7	158.0	167.9	178.4	189.5	201.4
<u>Current Liabilities</u>										
Accounts Payables	<u>19.4</u>	<u>22.2</u>	<u>25.8</u>	<u>29.9</u>	<u>32.4</u>	<u>34.9</u>	<u>37.3</u>	<u>39.8</u>	<u>42.5</u>	<u>45.3</u>
<u>Working Capital</u>	<u>73.9</u>	<u>82.6</u>	<u>93.7</u>	<u>106.1</u>	<u>114.2</u>	<u>123.1</u>	<u>130.6</u>	<u>138.6</u>	<u>147.1</u>	<u>156.1</u>

Industry Department
January 1985

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

CHARBONNAGES DU MAROC

PROJECTED FUNDS FLOW STATEMENT
(DH million - current terms)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
<u>Sources of Funds</u>										
Net Income	-	-	20.1	48.1	58.1	65.5	69.0	72.3	74.1	74.9
Financial Charges	7.9	13.4	21.2	26.2	29.5	31.5	30.1	26.5	22.9	19.3
Depreciation	70.8	82.3	96.2	98.5	87.4	84.8	83.0	82.9	84.8	87.7
Deferred Depreciation	29.5	39.1	17.6	-	-	-	-	-	-	-
Internal Cash Generation	108.2	134.8	155.1	172.8	175.0	181.8	182.1	181.7	181.8	182.0
<u>Borrowings</u>										
IBRD	20.9	55.1	24.7	38.0	72.2	45.6	-	-	-	-
KfW	-	56.0	66.5	-	-	-	-	-	-	-
France	15.2	26.6	24.7	3.8	1.9	-	-	-	-	-
Total Borrowings	36.1	137.8	115.9	41.8	74.1	45.6	-	-	-	-
Total Sources of Funds	144.3	272.6	271.0	214.6	249.1	227.4	182.1	181.7	181.8	182.0
<u>Applications of Funds</u>										
Investments	95.4	216.3	197.1	121.8	161.0	138.5	80.2	94.2	90.7	96.4
<u>Debt Service</u>										
Financial Charges	7.9	13.4	21.2	26.2	29.5	31.5	30.1	26.5	22.9	19.3
Principal Repayment	24.7	23.2	19.0	15.2	48.2	48.2	48.2	48.2	48.1	46.1
Total Debt Service	32.6	36.6	40.3	41.4	77.7	79.7	78.3	74.7	71.0	65.4
Change in Working Capital	11.9	8.6	11.1	12.4	8.2	8.8	7.5	8.0	8.5	9.0
Total Applications	139.9	261.5	248.5	175.6	246.9	227.0	166.0	176.9	170.2	170.8
<u>Cash Surplus or Deficit</u>										
Surplus	4.3	11.0	22.6	39.0	2.3	0.4	16.1	4.8	11.6	11.1
Accumulated Surplus	4.3	15.4	37.9	76.9	79.2	79.6	95.7	100.4	112.1	123.2
<u>Ratio</u>										
Debt Service Coverage	3.3	3.7	3.9	4.2	2.3	2.3	2.3	2.4	2.6	2.8

Industry Department
January 1985

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTCHARBONNAGES DU MAROCPROJECTED BALANCE SHEET
(DH million - current terms)

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
ASSETS										
<u>Current Assets</u>										
<u>Cash and Cash Equivalent</u>										
Cash	7.1	7.7	8.3	9.0	9.7	10.5	11.3	12.3	13.2	14.3
Receivables	45.5	52.0	61.0	71.0	76.5	82.4	87.3	92.5	98.1	104.0
Total Cash and Cash Equivalent	<u>52.6</u>	<u>59.7</u>	<u>69.3</u>	<u>80.0</u>	<u>86.2</u>	<u>92.9</u>	<u>98.6</u>	<u>104.8</u>	<u>111.3</u>	<u>118.3</u>
<u>Inventories</u>										
<u>Consumables</u>	17.6	20.0	23.3	27.0	29.3	31.6	33.7	35.9	38.3	40.8
Coal	23.1	24.9	26.9	28.9	31.1	33.5	35.6	37.7	40.0	42.3
Total inventories	<u>40.7</u>	<u>45.0</u>	<u>50.2</u>	<u>55.9</u>	<u>60.5</u>	<u>65.1</u>	<u>69.2</u>	<u>73.6</u>	<u>78.2</u>	<u>83.1</u>
<u>Accumulated Cash Surplus</u>	<u>4.3</u>	<u>15.4</u>	<u>37.9</u>	<u>76.9</u>	<u>79.2</u>	<u>79.6</u>	<u>95.7</u>	<u>100.4</u>	<u>112.1</u>	<u>123.2</u>
Total Current Assets	97.7	120.1	157.4	212.9	225.9	237.6	263.5	278.8	301.6	324.6
<u>Deferred Depreciation</u>	56.7	17.6	-	-	-	-	-	-	-	-
<u>Fixed Assets</u>										
<u>Existing Capital Assets</u>										
Gross Fixed Assets	519.1	519.1	519.1	519.1	519.1	519.1	519.1	519.1	519.1	519.1
Less: Accumulated Depreciation	<u>342.7</u>	<u>395.8</u>	<u>436.0</u>	<u>466.7</u>	<u>484.3</u>	<u>495.7</u>	<u>502.1</u>	<u>504.8</u>	<u>505.7</u>	<u>506.6</u>
Net Existing Assets	<u>176.4</u>	<u>123.3</u>	<u>83.1</u>	<u>52.4</u>	<u>34.8</u>	<u>23.4</u>	<u>17.0</u>	<u>14.3</u>	<u>13.4</u>	<u>12.5</u>
<u>New Capital Assets</u>										
New Assets	95.4	311.7	508.8	630.6	791.6	930.1	1101.3	1104.5	1195.2	1291.6
Less: Accumulated Depreciation	<u>6.9</u>	<u>36.1</u>	<u>92.1</u>	<u>159.8</u>	<u>229.7</u>	<u>303.1</u>	<u>379.7</u>	<u>459.9</u>	<u>543.8</u>	<u>630.6</u>
Net New Assets	<u>88.5</u>	<u>275.6</u>	<u>416.7</u>	<u>470.8</u>	<u>561.9</u>	<u>627.0</u>	<u>630.6</u>	<u>644.6</u>	<u>651.4</u>	<u>661.0</u>
Other Fixed Assets	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Total Fixed Assets	276.3	410.3	511.2	534.6	608.1	661.8	659.0	670.3	676.2	684.9
Total Assets	<u>430.7</u>	<u>548.0</u>	<u>668.6</u>	<u>747.4</u>	<u>834.0</u>	<u>899.4</u>	<u>922.5</u>	<u>949.1</u>	<u>977.8</u>	<u>1009.5</u>

CHARBONNAGES DU MAROC
PROJECTED BALANCE SHEET
(DH million - current terms)

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
<u>LIABILITIES AND EQUITY</u>										
<u>Current Liabilities</u>										
Accounts Payable	19.4	22.2	25.8	29.9	32.4	34.9	37.3	39.8	42.5	45.3
Current Portion LTD	<u>23.2</u>	<u>19.0</u>	<u>15.2</u>	<u>48.2</u>	<u>48.2</u>	<u>48.2</u>	<u>48.2</u>	<u>48.1</u>	<u>46.1</u>	<u>41.8</u>
Total Current Liabilities	42.6	41.2	41.0	78.0	80.6	83.1	85.5	87.9	88.6	91.0
<u>Long Terms Debt (Outstanding)</u>										
Existing	122.2	107.5	96.6	87.2	77.8	68.4	59.0	49.6	42.3	35.0
New	<u>27.4</u>	<u>160.9</u>	<u>272.4</u>	<u>275.4</u>	<u>310.8</u>	<u>317.6</u>	<u>278.8</u>	<u>240.0</u>	<u>201.2</u>	<u>166.7</u>
Total LTD	149.6	268.3	369.0	362.7	388.5	385.9	337.7	289.6	243.5	201.7
<u>Provisions</u>	<u>76.1</u>									
<u>Equity</u>										
Capital	84.8	84.8	84.8	84.8	84.8	84.8	84.8	84.8	84.8	84.8
Government Equity	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
Retained Earnings	<u>2.1</u>	<u>2.1</u>	<u>22.2</u>	<u>70.3</u>	<u>128.4</u>	<u>193.9</u>	<u>262.9</u>	<u>335.2</u>	<u>409.3</u>	<u>484.2</u>
Total Equity	162.4	162.4	182.5	230.6	288.7	354.2	423.2	495.5	569.6	644.5
<u>Total Liabilities & Equity</u>	<u>430.7</u>	<u>548.0</u>	<u>668.6</u>	<u>747.4</u>	<u>834.0</u>	<u>899.4</u>	<u>922.5</u>	<u>949.1</u>	<u>977.8</u>	<u>1009.5</u>
<u>Ratios</u>										
Quick Ratio	1.3	1.8	2.6	2.0	2.1	2.1	2.3	2.3	2.5	2.7
Current Ratio	2.3	2.9	3.8	2.7	2.8	2.9	3.1	3.2	3.4	3.6
Debt/Equity Ratio	0.48	0.62	0.67	0.61	0.57	0.52	0.44	0.37	0.30	0.24

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MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTCASH FLOWS FOR FINANCIAL RATE OF RETURN
(DH millions constant mid-1984)

<u>Year</u>	<u>Incremental Production</u>	<u>Incremental Revenues</u>	<u>Incremental Investments</u>	<u>Incremental Operating Costs</u>	<u>Incremental Taxes</u>	<u>Incremental Cash Flow</u>
1985	30	15	105	4	0	(94)
1986	110	55	118	20	0	(83)
1987	235	113	127	43	4	(61)
1988	315	154	101	56	32	(35)
1989	345	174	57	70	35	12
1990	400	205	8	92	37	68
1991	400	206	8	93	37	68
1992	400	206	(20)	93	32	101
1993	400	206	0	94	31	81
1994	400	206	6	95	31	76
1995	400	206	6	95	29	76
1996	400	206	(20)	95	29	102
1997	400	206	(20)	95	29	102
1998	400	206	(20)	95	29	102
1999	400	206	(20)	95	29	102

Financial Rate of Return: 15.7% after taxes
23.9% before taxes

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MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

POWER GENERATION COST COMPARISON

Mohammedia Oil versus Jerada Coal-Fired Plant
(Figures in 1984 US\$)

		<u>Mohammedia Oil-Fired Plant</u>	<u>Jerada Coal-Fired Plant</u>
1. <u>Fuel Consumption</u>			
Heat rate	Mcal/MWh	2,400	3,200
Fuel consumption rate	$\frac{t^a}{MWh}$	0.5	0.67
	%	100	133
Additional Cost for higher fuel consumption at Jerada Plant	US\$/ $\frac{t^a}{}$	-	<u>32.5</u> ^{b/}
2. <u>Operating and Maintenance Cost</u>			
O&M cost per unit of energy output	US¢/kWh	0.4	0.8
	US\$/MWh	4.0	8.0
Energy output/input ratio	MWh/ $\frac{t^a}{}$	2.0	1.5
O&M cost per unit of energy output	US\$/ $\frac{t^a}{}$	8.0	12.0
	%	100	150
Additional cost for higher operating and maintenance cost at Jerada plant	US\$/ $\frac{t^a}{}$	-	<u>4.0</u>
3. <u>Total additional cost for Jerada plant</u>			
	US\$/ $\frac{t^a}{}$	-	<u>36.5</u>

a/ Ton of Jerada coal equivalent (4,800 kcal/kg).

b/ 33% of fuel oil price (US\$195/t, 9,600 kcal/kg).

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECTOPPORTUNITY COST OF JERADA COAL

(All figures in 1984 US\$ per ton of Jerada Coal, heating value 4,800 kcal/kg for coal supplied to ONE and CIOR, 7,500 kcal/kg for coal supplied to other consumers).

	----- Consumer -----		
	<u>ONE</u>	<u>CIOR</u>	<u>Other Local Consumers</u>
Alternative Energy Source	Fuel Oil	Steam coal imported through Nador	Anthracite imported through Casablanca
CIF Cost of Alternative Energy	97.5	45.0	100.0
plus: Cost for Handling at Harbor	-	7.0	7.0
Transport to Consumer	-	<u>10.0</u>	<u>2.3 a/</u>
Cost of Alternative Energy at Consumer	<u>97.5</u>	<u>62.0</u>	<u>109.3</u>
Minus: Transport of Jerada Coal to Consumer	-	2.0	11.5 b/
Additional Cost for using Jerada Coal	36.5 c/	-	-
Opportunity Cost of Jerada Coal	<u>61.0</u>	<u>60.0</u>	<u>97.8</u>

a/ Rail transport over average distance of 100 km.

b/ Rail transport over average distance of 500 km.

c/ Lower efficiency and higher operating and maintenance cost of Jerada plant as compared with Mohammedia oil fired plant (see Annex 8-1)

MOROCCO - JERADA COAL MINE MODERNIZATION AND EXPANSION PROJECT

CASH FLOWS FOR ECONOMIC RATE OF RETURN
(DH million constant mid-1984)

<u>Year</u>	<u>Incremental Revenues</u>	<u>Incremental Investments</u>	<u>Incremental Operating Costs</u>	<u>Incremental Cash Flow</u>
1985	16	105	4	(93)
1986	63	118	18	(73)
1987	137	127	40	(30)
1988	185	101	51	33
1989	202	57	58	87
1990	234	8	75	151
1991	234	8	76	150
1992	234	(20)	76	178
1993	234	-	77	157
1994	234	6	78	150
1995	234	6	78	150
1996	234	(20)	78	176
1997	234	(20)	78	176
1998	234	(20)	78	176
1999	234	(20)	78	176

Economic Rate of Return = 36%

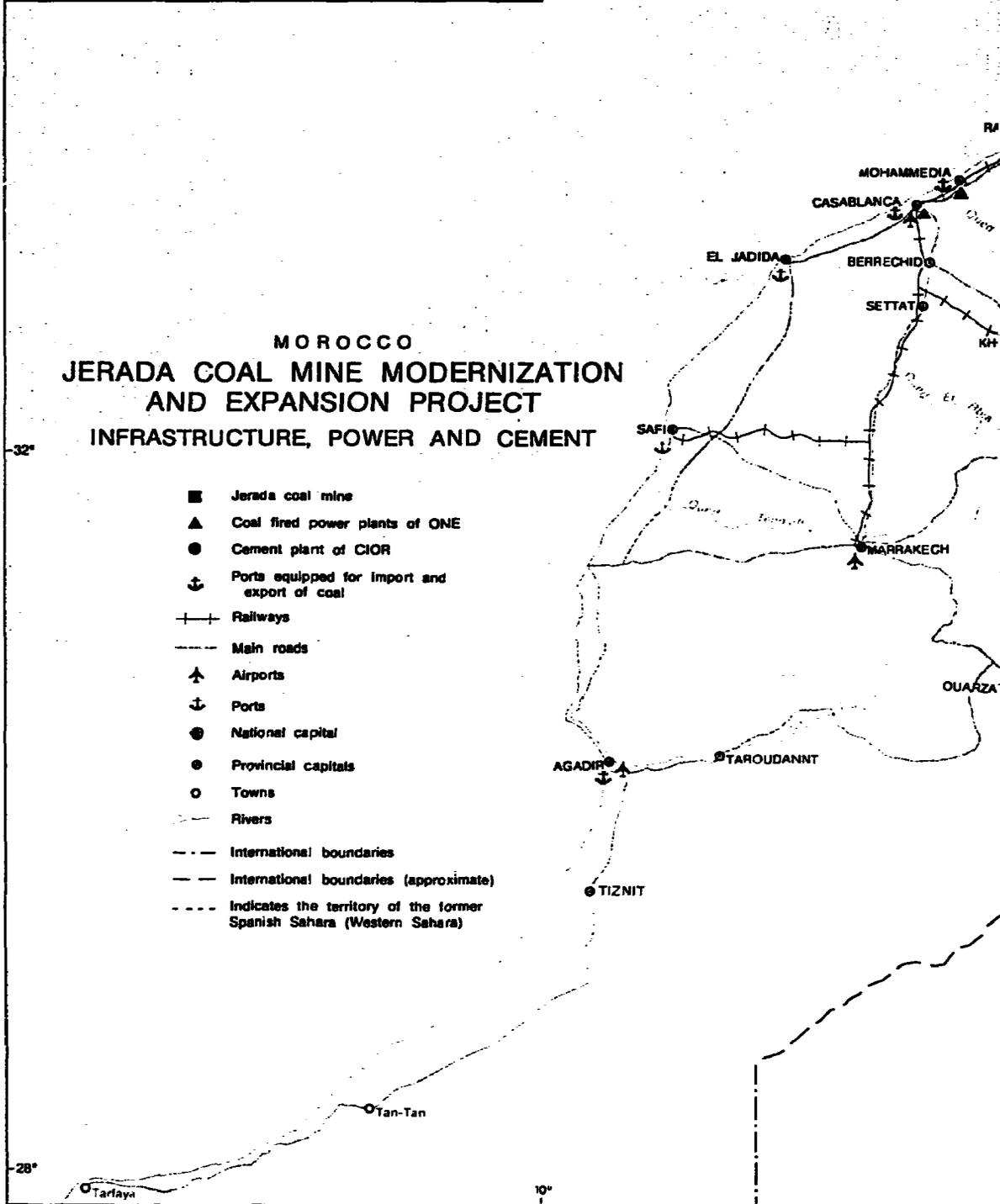
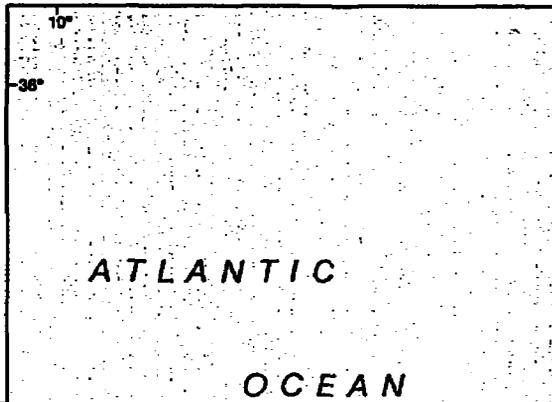
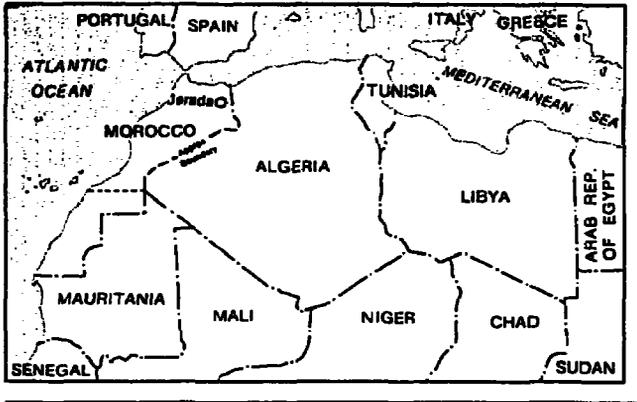
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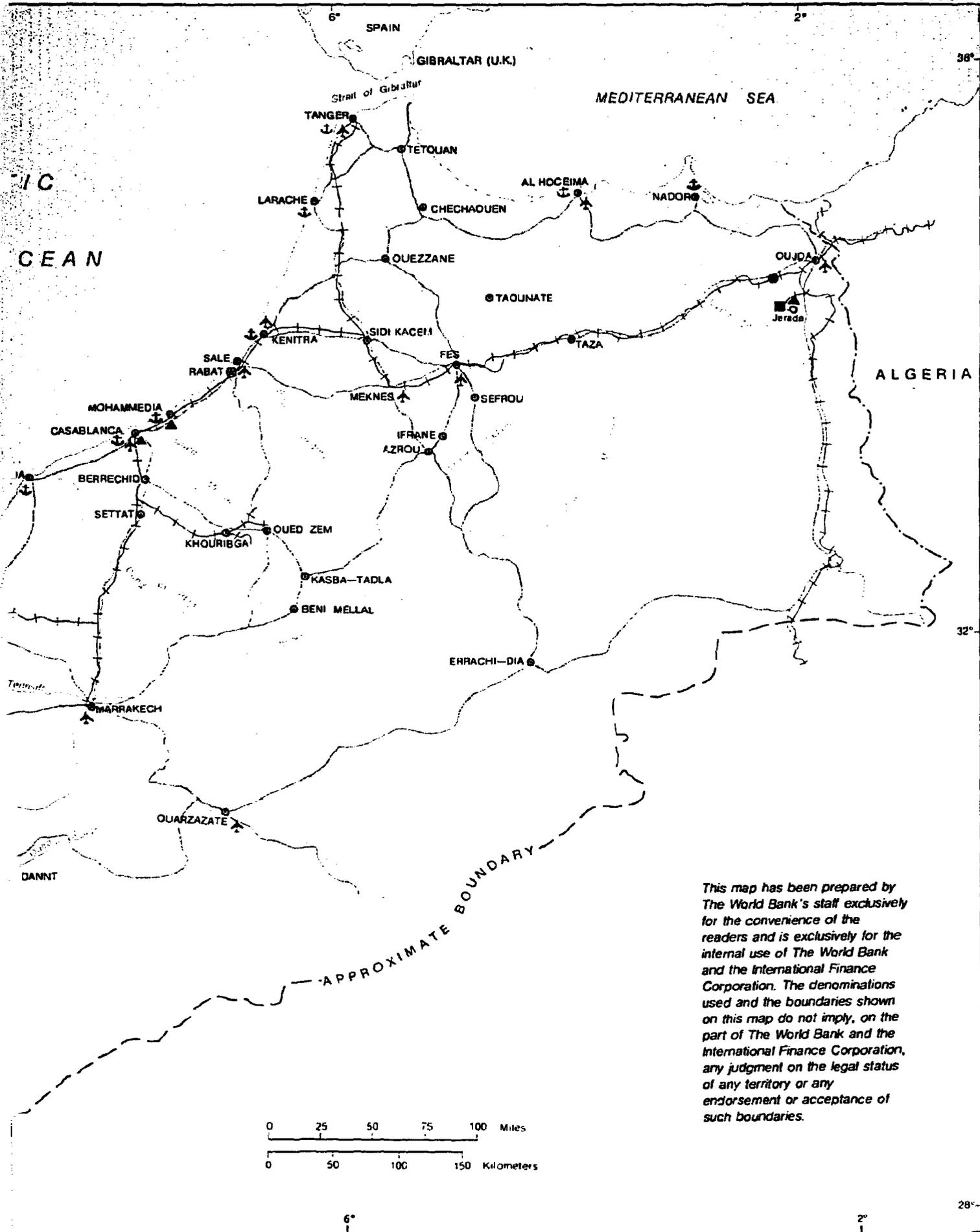
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DOCUMENTS AVAILABLE IN PROJECT FILE

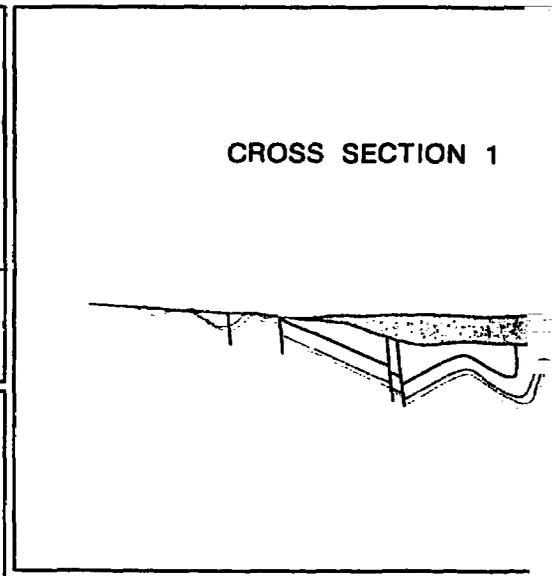
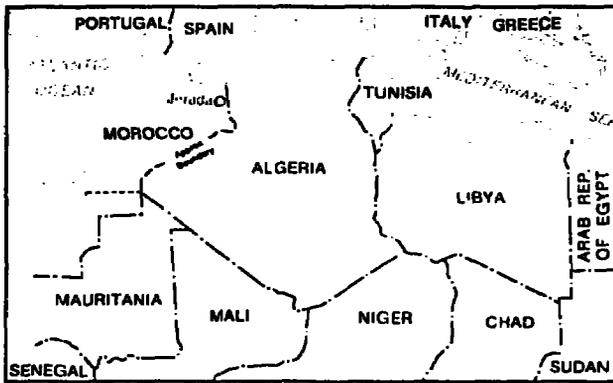
1. Etude de Factibilite du Plan de Developpement de Jerada. BME (3 volumes), 1984.
2. Detailed Calculation of Capital Cost. Bank Staff (Computer Printouts), 1984.
3. Etude de Diagnostic des CdM. Charbonnages de France (1 volume), 1983.
4. Report on the Jerada Coal Mine. K. Wardell and Partners, 1981.
5. L'Industrie Charbonniere au Maroc. MEM (1 volume), 1983.
6. Le Bassin Houiller de Jerada. B. Owodenko, 1976.
7. Technical Assistance Contract CdM/BME, 1984.
8. CdM and SOCOCHARBO Rapports Annuels: 1979-1983.

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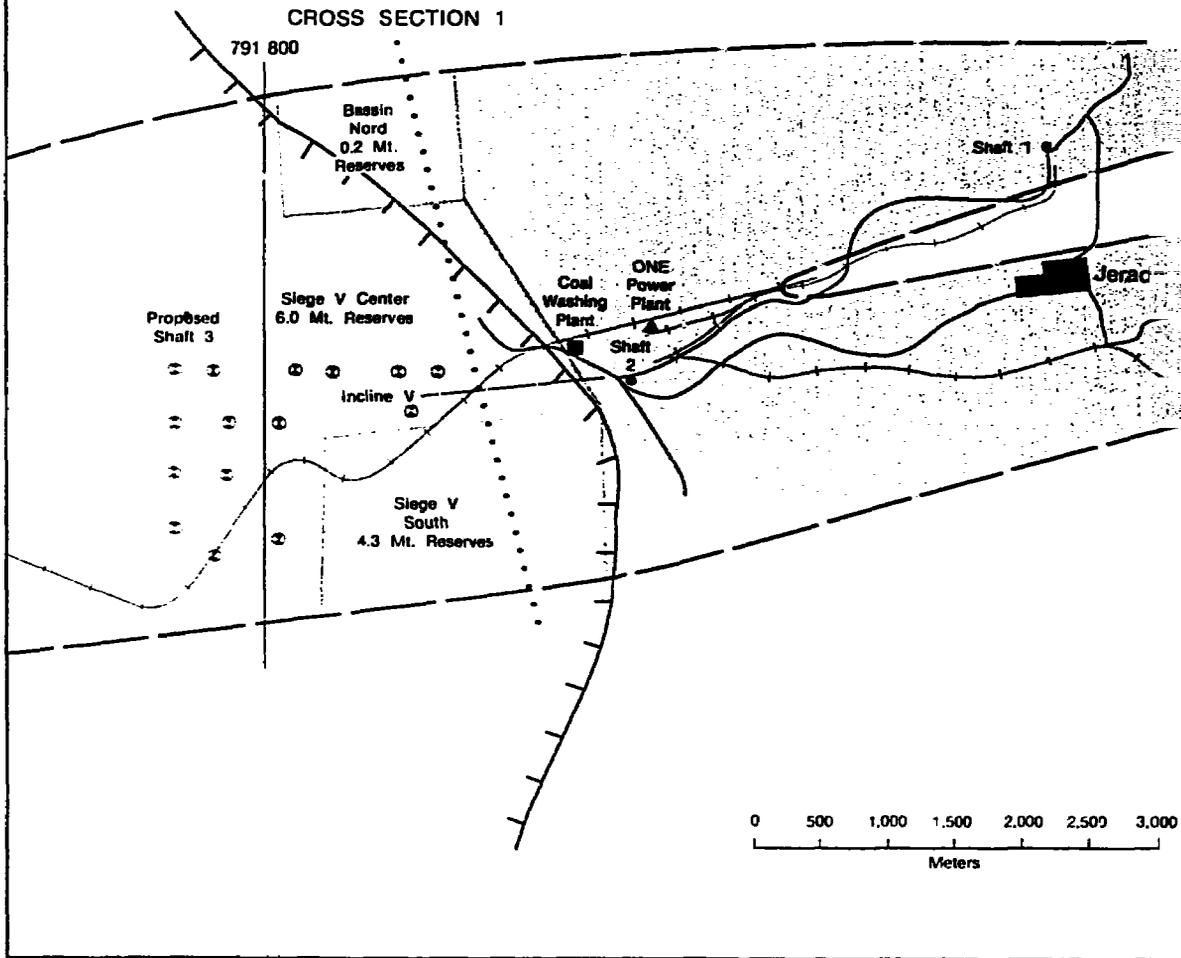




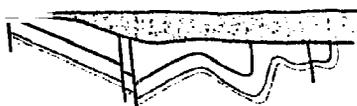
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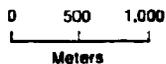
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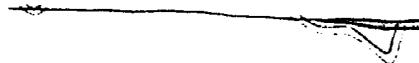
SECTION 1



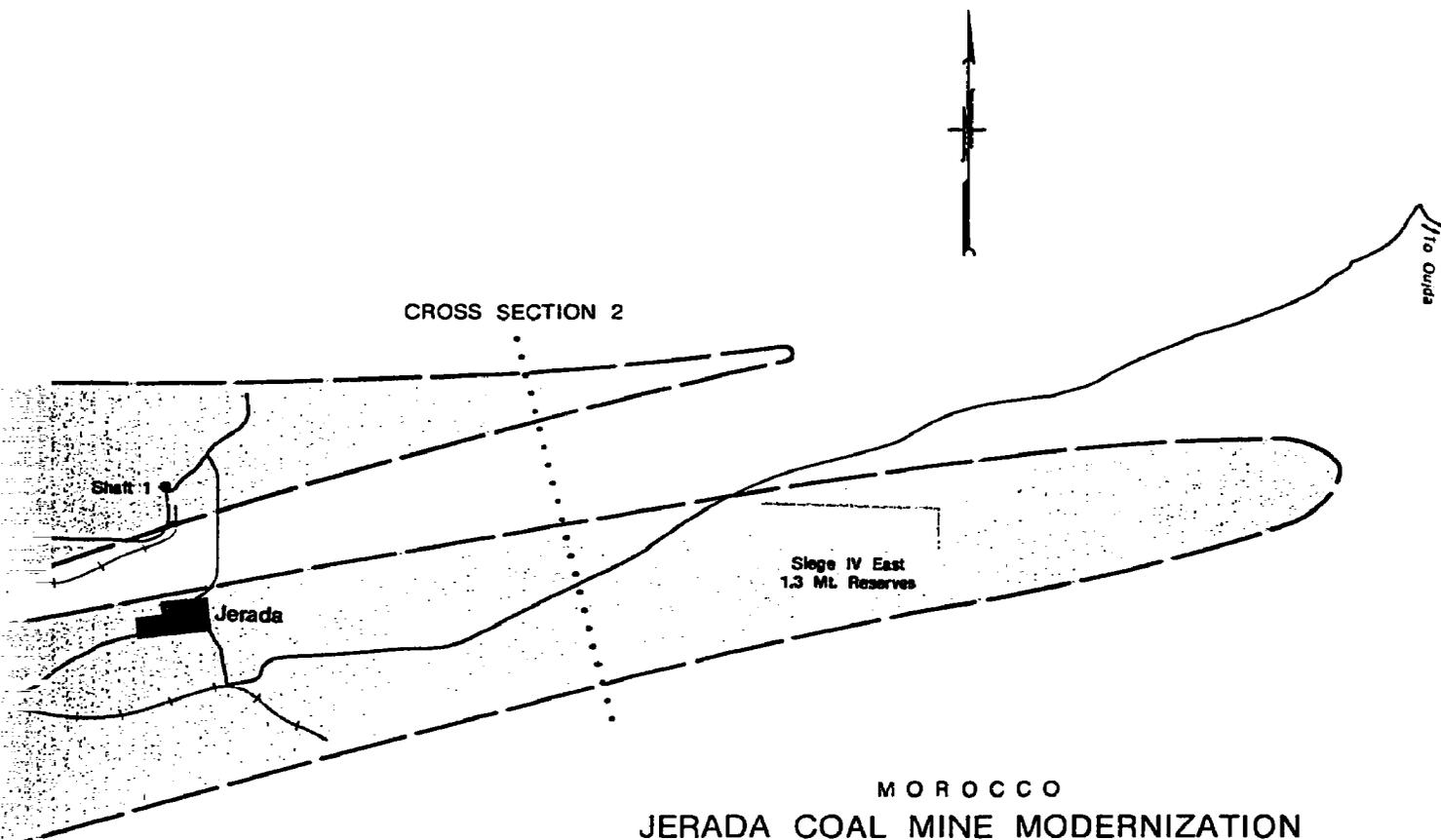
- Overburden
- Faults
- Seams
 - F
 - C
 - B
 - A



CROSS SECTION 2



CROSS SECTION 2



MOROCCO
 JERADA COAL MINE MODERNIZATION
 AND EXPANSION PROJECT
 EXPLOITATION OF JERADA COAL BASIN
 (EASTERN PORTION)

- Mined out
- Under exploitation
- Future exploitation (Project area)
- Proposed deep boreholes
- Limit of cover of younger geological strata over coal bearing strata
- Approximate limit of coal basin
- Roads
- Railroads
- International boundaries
- International boundaries (approximate)
- Indicates the territory of the former Spanish Sahara (Western Sahara)

