The Mineral Industry of Morocco

By W. F. Stowasser [1]

The recent sharp increases in international commodity prices stimulated the Moroccan mining industry and, in particular, the phosphate rock mining and processing segment. Morocco is the world's largest exporter of phosphate rock. With world demand for phosphate rock exceeding supplies, Morocco led other phosphate rock producing countries by initiating increases in the average price from $14 to $42 [2] per ton during the year. The range of listed export prices for phosphate rock effective January 1974 in dollars per ton, free-along-side (f.a.s), and in percent of bone phosphate of lime $Ca_3(PO_4)_2$ (BPL) follow:

Percent	Value (per ton)
80	$50.00
77	47.25
75	42.00
72	40.00
70	37.50

Source: Phosphorus & Potassium. No. 68, November–December 1973, p. 3.

The Office Cherifien des Phosphates (OCP) in early 1973 implemented a price of $14.20 f.a.s. for 75% BPL material, the highest price in 16 years. During the late 1960's, the price was only $11.75 per ton, and sales were made below this level. Between 1971 and 1973, price increases were linked to devaluation of the dollar and did not have much of an effect on Moroccan exchange. If the 1952 selling price of $14.20 per ton had been increased at an annual rate of 5%, the price in 1974 would have been $41.55. This factor, as well as the recent rapid increases in world fertilizer prices, was considered in establishing the price level in late 1973.

The trend in Moroccan mineral production is toward producing higher value products by increased processing of raw materials before export. The Oued El Heimer lead smelter has been reconstructed, and active plans exist for two additional smelters on the Atlantic coast to process ores. Of far greater importance are construction plans for two phosphoric acid plants and an expanded fertilizer complex at Safi. These plants will, by 1977, consume about 17% of Morocco's phosphate rock production. They will be prototypes of a major mineral-chemical industrial complex that will be in operation by the end of the century.

Moroccan Government mineral policy was described in the 1973–77 5-year plan that was released in late 1973. The Government is dedicated to encouraging mineral production and developing new mines. The Mines Office in the Ministry of Commerce is committed to basic geological research programs with particular attention to the Rif Mountains and the Mediterranean Shelf. The Bureau de Recherches et de Participations Minières (BRPM) is Morocco's chief mining group in all areas except phosphorus. In addition to participating in the operation of some two dozen operating mines, BRPM is searching for new commercial deposits of copper, lead, zinc, and nickel in nine specific regions in the country. BRPM will spend $74 million on these programs during the plan period and anticipates an additional expenditure of about $200 million from private investors and bank credits.

As part of the general revision of the 1961 Investment Code, the Government of Morocco issued a new code in 1973 relating specifically to mining.[3] It grants to any investor of more than $21,000 (1) exoneration from customs duties and certain local taxes, (2) guaranteed retransfer of dividend income, (3) permission to deduct from the profits tax, the accelerated amortization of capital equipment, and (4) a partial rebate of interest due on project loans from the National Development Bank. In-

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[2] Where necessary, values have been converted from Moroccan Dirhams (MD's) to U.S. dollars at the rate of MD's 4.66=US$1.00.

[3] U.S. Embassy, Rabat, Morocco. Department of State Airgram A-67, June 17, 1974.

vestors supplying equipment worth at least $107,000 and creating at least 50 new jobs are also eligible for special financial assistance. Investors bringing more than $6 million into the country can negotiate additional benefits from the Government.

These incentives are only applicable to foreign investors who form a joint venture in which Moroccan capital is at least 50%. New foreign investors usually enter into joint mining ventures with the BRPM or with private Moroccan interests. The Mines Office of the Ministry of Commerce issues all exploration permits, and the BRPM applies for permits in the same manner as would a private company.

The code also proposes two intragovernmental reforms which would further stimulate the mining industry in Morocco. A 0.5% ad valorem tax on certain mineral exports would be ended, and the National Transport Office's monopolistic control over the movement of mineral production from mine to port would be ended.

PRODUCTION

Moroccan mineral production, excluding the volumes of water and natural gas, increased from 16.8 million tons in 1972 to 19.0 million tons in 1973, a gain of 13%. Most of this 2.2 million ton increase was attributed to greater output of phosphate rock. Production of phosphate rock increased 14% to 17.1 million tons in 1973 and represented 90% of Morocco's total mineral production tonnage. With the selling price averaging $42 per ton in 1973, revenue from phosphate rock exports represented about 50% of Morocco's total export receipts and about 30% of the country's budget. In the expectation that the market for phosphate rock will remain strong for many years, the OCP is planning new mines and ordering equipment to increase production to over 50 million tons annually by the mid-1980's.

Nonphosphate minerals production and exploration programs are increasing but to a much lesser degree. Production increased for a number of minerals, reflecting a strong export demand. Several new copper, lead, and fluorspar mines will open in 1974 and 1975. The current high price of petroleum is stimulating the oil-short Moroccans to find new energy sources.

Among the mineral fuels, anthracite production increased 3% to 565,000 tons in 1973; natural gas output rose to 65.2 million cubic meters, a gain of 26% over that of 1972; and production of crude petroleum increased by 48% to 42,153 tons.

In the metals sector, antimony concentrate output increased 34% to 2,698 tons and copper concentrate, lead concentrate, and iron ore increased 8%, 9%, and 60%, respectively, over 1972 levels of production. Manganese production increased sharply by 52%. Zinc concentrate production declined 10%, and tin ore production increased 25%. Cobalt concentrate production declined 11% to 10,157 tons.

Bentonite clay and montmorillonite clay production declined 1% and 32%, respectively. Smectite clay production increased 24%. Barite output increased 10% to 102,691 tons.

Table 1.—Morocco: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Antimony concentrate:			
Gross weight	4,266	2,008	2,698
Metal content	[r] 1,972	832	1,133
Cobalt concentrate:			
Gross weight	9,777	11,444	10,157
Metal content	978	1,602	1,422
Copper			
Concentrate:			
Gross weight	[r] 2,843	3,831	4,251
Metal content	[r] 13,347	13,528	14,660
Matte (byproduct of lead smelter)	198	--	--
Iron and steel:			
Iron ore, direct shipping, gross weight	623,257	234,180	374,749
Pig iron [e]	10,000	10,000	10,000
Steel [e]	1,000	1,000	1,000
Lead:			
Concentrate:			
Gross weight	122,630	146,282	158,830
Metal content	[r]78,000	86,600	108,004
Smelter, primary	18,716	--	--
Manganese ore, chemical grade	101,456	96,067	146,149
Nickel, content of cobalt ore	100	200	[e] 200
Silver: [2]			
From Imiter operation ---thousand troy ounces	809	878	818
Domestic smelter recovery ---do	746	--	--
Content of exported lead concentrate ---do	1,387	2,498	[e] 2,700
Total ---do	[r] 2,942	3,376	[e] 3,518
Tin:			
Concentrate:			
Gross weight ---long tons	[r] 13	12	15
Metal content ---do	8	8	10
Smelter, primary ---do	12	12	12
Zinc concentrate:			
Gross weight	22,015	36,417	32,677
Metal content	[r] 12,300	19,500	18,299
NONMETALS			
Barite	84,474	93,240	102,691
Cement, hydraulic ---thousand tons	1,475	1,542	1,619
Clays, crude:			
Bentonite	3,801	8,700	8,628
Smectite	14,253	15,438	19,122
Other, including fuller's earth	4,880	7,050	4,820
Fertilizer materials, crude, natural, phosphate rock thousand tons	12,008	14,971	17,077
Goethite	37	25	[e] 27
Mineral water ---cubic meters	12,597	14,215	16,869
Pyrites and pyrrhotite:			
Gross weight	440,549	430,006	407,098
Sulfur content	132,165	133,301	134,339
Salt, all types	53,102	45,508	27,601
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite ---thousand tons	475	547	565
Fuel briquets ---do	21	17	9
Gas, natural:			
Gross production ---million cubic feet	1,680	1,822	2,302
Marketed ---do	[r] 1,608	1,763	[e] 2,200
Petroleum:			
Crude oil ---thousand 42-gallon barrels	172	216	320
Refinery products:			
Gasoline ---do	2,895	2,968	[e] 3,600
Jet fuel ---do	536	541	[e] 700
Kerosine ---do	333	508	[e] 600
Distillate fuel oil ---do	2,941	3,983	[e] 5,000
Residual fuel oil ---do	3,178	4,628	[e] 5,700
Other ---do	992	648	[e] 800
Refinery fuel and losses ---do	1,444	1,299	[e] 1,600
Total ---do	12,319	14,575	[e] 18,000

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, Morocco also produces manufactured phosphatic fertilizers, fluorspar, and a variety of crude construction materials, but available information is inadequate to make reliable estimates of output levels.

[2] Total Moroccan silver production has been revised upward to include silver content of lead concentrates exported from Morocco for smelter; data in previous year's edition of this chapter reported as "content of domestically processed and exported lead concentrates" in reality represented only the silver content of domestically processed concentrates.

Table 2.—Morocco: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	816	594	France 224; Italy 132; Netherlands 76.
Antimony, ore and concentrate	4,070	3,302	France 1,875; Belgium-Luxembourg 452; Spain 390.
Cobalt, ore and concentrate	4,750	12,606	France 8,306; People's Republic of China 4,300.
Copper:			
Ore and concentrate	12,323	13,598	Belgium-Luxembourg 5,895; West Germany 5,703; People's Republic of China 2,000.
Metal and alloys, all forms	1,043	1,077	France 379; West Germany 235; Spain 187.
Iron and steel:			
Ore and concentrate ---thousand tons--	457	--	
Roasted pyrites	60	308,210	Czechoslovakia 167,140; West Germany 101,780.
Scrap	30,775	31,566	Italy 10,596; Spain 6,090; People's Republic of China 5,277.
Ferroalloys	--	66	All to Netherlands.
Semimanufactures	10	3,321	Italy 3,300.
Lead:			
Ore and concentrate	85,014	138,194	France 59,289; Spain 23,231; Greece 14,025.
Crude, unalloyed	16,071	--	
Manganese, ore and concentrate	91,787	117,693	United States 27,587; Netherlands 24,770; France 22,310.
Nickel including alloys, all forms	60	--	
Silver, all forms ----------troy ounces--	492,976	NA	
Tin, all forms ----------long tons--	7	--	
Zinc:			
Ore and concentrate	19,456	21,649	Belgium-Luxembourg 8,363; Italy 5,513; France 4,073.
Oxides	NA	2,495	Spain 1,575; Italy 920.
Matte	NA	164	France 135; Belgium-Luxembourg 29.
Metal, including alloys, all forms	23	78	Mainly to France.
Other:			
Ore and concentrate	r 19,456	18,055	France 16,895; Spain 1,160.
Ash, slags, residues	848	2,861	France 2,587; Belgium-Luxembourg 70. (Not reported 203.)
Oxides	3	1	Mainly to Algeria.
NONMETALS			
Barite and witherite	87,477	84,934	United Kingdom 49,770; United States 24,384.
Boron minerals, natural	NA	8	NA.
Cement	452	--	
Clays and clay products (including refractory brick):			
Bentonite	288	1,139	Spain 388; United Kingdom 150. (Not reported 601.)
Fuller's earth	2,899	7,333	Tunisia 5,548; Algeria 1,770.
Refractory	2,456	14,167	NA.
Smectite	9,520	6,721	Spain 5,259.
Other	--	180	Mainly to Spain.
Feldspar and related materials	NA	2	NA.
Fertilizer materials:			
Crude, phosphatic ------thousand tons--	11,868	13,581	Spain 1,670; France 1,546; Belgium-Luxembourg 1,338; United Kingdom 1,312.
Manufactured:			
Nitrogenous	3,469	1,400	All to France.
Phosphatic	197,096	260,318	Brazil 80,795; Bulgaria 38,776; Yugoslavia 29,800.
Other, including mixed	61,312	4,951	Kenya 2,951; Netherlands 2,000.
Fluorspar	8	--	
Gypsum and plasters	105,762	130,587	Japan 61,386; Portugal 30,810; Zaire 14,430; Senegal 13,965.
Lime	172	110	NA.
Pigments, mineral, including processed iron oxides	--	25	All to France.
Precious and semiprecious stones, natural and synthetic ----------kilograms--	735	556	Netherlands 300; United States 206.
Salt and brine	160	(1)	All to ship stores.
Sodium and potassium compounds, n.e.s	22	--	
Stone, sand and gravel:			
Dimension, crude and partly worked	4,237	3,709	Italy 2,807; Belgium-Luxembourg 421; West Germany 323.
Gravel and crushed rock	38,245	51,721	Gibraltar 9,497.

See footnotes at end of table.

Table 2.—Morocco: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Sand, excluding metal bearing	29,047	56,741	NA.
Quartz and quartzite	20	204	NA.
Sulfur, elemental, all forms	83	1,359	NA.
Vermiculite, perlite, chlorite	NA	9	All to Spain.
Other nonmetals, n.e.s., crude	2	3	All to France.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	47,397	21,185	Italy 9,940; Algeria 8,545; France 2,700.
Petroleum refinery products:			
Gasoline (including natural) 42-gallon barrels	12,915	804	All to ship stores.
Kerosine and jet fuel ---do---	77,741	55,930	Do.
Distillate fuel oil ---do---	25,526	57,098	Mainly to ship stores.
Residual fuel oil ---do---	r 3,046	5,266	Italy 3,536; ship stores 1,730.
Lubricants ---do---	r 2,460	2,525	Mainly to ship stores.
Liquefied petroleum gas ---do---	852	1,160	All to Gibraltar.
Other ---do---	9	610	Mainly to ship stores.

r Revised. NA Not available.
1 Less than ½ unit.

Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Ore (bauxite) and concentrate	2,070	1,200
Oxide and hydroxide	774	726
Metal, including alloys, all forms	2,934	3,405
Antimony metal, including alloys, all forms	5	15
Arsenic trioxides, pentoxides, and acids	16	25
Bismuth, crude ---kilograms---	93	215
Cadmium metal, all forms ---do---	205	277
Chromium:		
Ore and concentrate	--	23
Oxide and hydroxide	7	20
Metal, including alloys, all forms ---kilograms---	153	85
Cobalt oxides ---do---	20	23
Copper:		
Matte	3	--
Copper sulfate ---kilograms---	335	440
Metal, including alloys, all forms	2,889	3,652
Gold metal, including alloys ---troy ounces---	1,327	48,425
Iron and steel:		
Roasted pyrites	--	3,755
Metal:		
Scrap	30	431
Pig iron, ferroalloys, etc	1,449	1,743
Powders, blooms, billets, slabs	43	8,386
Semimanufactures	17,488	297,478
Lead:		
Ore and concentrate	(1)	(1)
Oxides	188	318
Metal:		
Unwrought	225	1,861
Semimanufactures	136	114
Magnesium metal, including alloys, all forms	214	1
Manganese:		
Ore and concentrate	79	52
Oxides	127	102
Mercury ---76-pound flasks---	87	98
Molybdenum, including alloys, all forms ---kilograms---	32	50
Nickel:		
Matte	--	1
Scrap	5	--
Unwrought	18	5
Semimanufactures	586	803
Platinum-group metals, including alloys, all forms ---troy ounces---	(1)	129
Selenium ---kilograms---	2 203	202
Silver metal, including alloys ---troy ounces---	9,331	12,843
Tin metal, all forms ---long tons---	293	399
Titanium oxides	736	865

See footnotes at end of table.

Table 3.—Morocco: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS—Continued			
Zinc:			
Oxides		483	596
Metal and alloys:			
Unwrought		1,084	873
Blue powder	kilograms	193	54,898
Semimanufactures		197	180
Other:			
Ore and concentrate of vanadium and molybdenum		--	3
Ash and residue of metals, n.e.s		17	--
Oxides, hydroxides, etc., of metals, n.e.s		10	17
Metals, including alloys, all forms:			
Arsenic and tellurium	kilograms	[3] 150	(1)
Cobalt, columbium, manganese, tantalum, titanium, tungsten, cermets, and rare-earth metals	do	16	177
Pyrophoric alloys	do	1	156
NONMETALS			
Abrasives, natural, n.e.s		404	24
Asbestos		3,638	3,145
Barite		1	4
Boron materials:			
Bromine	kilograms	46	221
Crude natural borates		1,150	1,600
Oxide and acid		9	12
Cement, hydraulic		102,705	77,859
Chalk		3,265	3,422
Clays and clay products:			
Crude clays:			
Bentonite		1	(4)
Fuller's earth		14	(4)
Kaolin and refractory		15,447	3,050
Smectite		6,459	2,000
Other		18	10,267
Diatomite and other infusorial earth		421	321
Feldspar		274	25
Fertilizer and fertilizer materials:			
Crude and manufactured:			
Nitrogenous		111,134	123,742
Phosphatic		(1)	(1)
Potassic		37,892	43,410
Mixed		1,667	134
Ammonia		14,921	203,240
Fluorspar		--	681
Graphite, natural		4	16
Gypsum and plasters		NA	(1)
Iodine		(1)	(1)
Kyanite and sillimanite		20	--
Lime		279	225
Magnesite		271	328
Mica:			
Crude, including splittings and waste		21	20
Worked, including agglomerated splittings		1	2
Pigments, mineral, including processed iron oxides:			
Natural		554	446
Iron oxides, processed		570	541
Precious and semiprecious stones (except diamond)	kilograms	963	434
Salt		49	7,740
Sodium and potassium compounds, n.e.s		6,252	11,515
Stone, sand and gravel:			
Dimension stone, including slate		828	618
Dolomite		1,106	1,374
Gravel and crushed rock		509	44
Quartz and quartzite		105	65
Sand, excluding metal bearing		13,858	18,498
Sulfur and pyrites:			
Pyrites, unroasted, gross weight		--	2
Elemental		361	36,712
Sulfur dioxide		100	162
Sulfuric acid		28	5,051
Talc, steatite, soapstone, pyrophyllite		1,324	1,164
Vermiculite and related materials		340	79
Other:			
Crude nonmetals, n.e.s		610	516
Oxides and hydroxides of barium, magnesium, and strontium		18	10
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon		1,878	2,579
Coal and coke, including briquets		67,100	52,401
Hydrogen, helium, rare gases		12	9
Peat, including peat briquets and litter		1,079	522

See footnote at end of table.

Table 3.—Morocco: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude	thousand 42-gallon barrels	12,175	13,082
Refinery products:			
Gasoline	do	39	22
Kerosine and jet fuel	do	232	246
Distillate fuel oil	do	489	647
Residual fuel oil	do	1,089	594
Lubricants	do	181	201
Other:			
Liquefied petroleum gas	do	533	649
Asphalt and bitumen	do	r 492	1
Mineral jelly and waxes	do	143	130
Other	do	2	72
Crude chemicals derived from coal, gas, and oil distillation		2,679	8,785

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Including tellurium, if any.
[3] Excludes tellurium.
[4] Included with other.

TRADE

Phosphate rock was the principal commodity exported from Morocco. From 11,868,000 tons in 1971, exports increased to 13,581,000 tons in 1972. Iron ore exports declined from 457,000 tons in 1971 to none in 1972. Exports of lead concentrate increased sharply from 85,000 tons in 1971 to 138,000 tons in 1972. Refractory clay, cobalt concentrate, copper concentrate, manganese ore and concentrate, and zinc concentrate all showed degrees of higher exports. Reduction in export tonnage was shown for anthracite coal, antimony concentrate, barite, and smectite clay.

The principal metal imported into Morocco was semifinished steel shapes. Cement, nitrogenous and potassic fertilizers, ammonia, sulfur, coal and coke, and crude petroleum were the principal nonmetals and mineral fuels imported into Morocco in 1972.

COMMODITY REVIEW

METALS

Copper.—Copper concentrate output from four small mines in the High Atlas Mountains did not increase significantly in 1973. Only 14,600 tons was produced. Production will probably dwindle at these four small mines in 1974 when new mines at Ouansimi and Talat Nouame, near Agadir, operated by BRPM and Geomin of Romania, respectively, will open. A new copper-washing plant at Tazallaght is scheduled to start-up in 1974. Another mine, at Beni-Mellal, under BRPM Czech ownership, is scheduled to start-up in 1975. BRPM, Onium, and Mitsui have agreed to open a large mine at Bleida in the pre-Sahara near Zagora. The plant, valued at about $15 million, will process 800 tons of ore per day. It is scheduled to come onstream in 1976. Two other pre-Saharan copper deposits, at Merija and Oumjerane, appear to be suitable for future mines. A study of a low-grade copper deposit at Allous, Middle Atlas Area, will determine if it can be economically mined. With current high world copper prices, these previously marginal deposits located in remote areas may become economically attractive to mine. The 5-year plan forecasts that by 1977 copper production will increase threefold and the Government will install and operate a 30,000-ton-per-year copper foundry at Safi.

Iron Ore.—The BRPM-owned Société d'Exploitation des Mines du Rif (SEFERIF) started pelletizing concentrates produced from low-grade ore near Nador. SEFERIF produced 150,000 tons of pellets in the second half of 1973. The plant is expected to attain the design production level of 850,000 tons in 1974. All of the production is exported to Europe. The decision of the

Government of Morocco to construct a new port, ending dependence on the Spanish enclave port of Melilla, and a steel mill at Nador, will restrict exports of pellets to 50% of production. The reserves at Nador are an estimated 35 million tons.

Lead.—Production of lead concentrate increased 9% to 159,000 tons in 1973. Lead is Morocco's second most important export mineral, and with higher world prices as an incentive, the country's principal mines were producing as much as possible. When the Touissit mine near the Algerian border and the nearby Ouel el Heimer smelter start operating in late 1974, annual production will increase by about 20,000 tons. Plans are proceeding to construct another smelter with a capacity of 100,000 tons per year. It will be erected in Kenitra within the next few years and receive concentrates from the Middle Atlas Area.

The largest lead mine operating in Morocco is the BRPM-owned Zellidja mine at Zaida near Midelt. From an estimated 8 million tons of reserves assaying 3.2% lead, 40,000 tons of concentrate is produced annually. Production costs are about $6.44 per ton of concentrate. The ore is mined from open pits, crushed, ground, and floated. Byproduct barite will be produced in 1974.

Manganese.—Increased export demand for chemical grade manganese resulted in production from Morocco's one mine at Imini increasing by 52% to 146,000 tons in 1973. If markets for the 23 grades of manganese dioxide continue strong in 1974, production may increase slightly but will be restricted from any further large increase by the limited capacity of the mine and plant. The mine and mill are operated by the joint French–BRPM firm Société Anonyme Chérifienne d'Études Minières (SACEM). Two shafts descend to 50- to 100-foot levels at Tifnkit and Bou Tazoult along a 20-kilometer-long vein which runs due west of the Quarzazate-Marrakech road. Exploration is continuing east of the road to find additional reserves. Proven reserves are 1.5 million tons with another one-half to 1 million tons probable.

NONMETALS

Fluorspar.—Production of fluorspar from the El Hamman deposit in central Morocco is planned to begin in 1974. At full capacity, 80,000 tons of 50% refined ore and 60,000 tons of 98% refined ore will be produced. The reserves are of the order of 5 million tons. In addition, BRPM and Zellidja have agreed to exploit a smaller deposit with reserves of the order of 1 million tons near Tarourit.

Phosphate Rock.—Morocco produced 17,076,900 tons in 1973, an increase of 14% over that of 1972. This 2.0-million-ton increase represented 35% of the total increase in world production in 1972. Morocco maintained its position as the world's leading exporter of phosphate rock with record exports of 16.1 million tons, an increase of 2.5 million tons over that of 1972. Exports to Western European markets rose by 0.9 million tons in 1973. The largest increases in shipments were to Ireland, an additional 168,700 tons; France, an increase of 245,800 tons; Italy, an increase of 104,000 tons; and the United Kingdom, an increase of 129,000 tons.

All Eastern European markets received additional tonnages from Morocco in 1973 except for Czechoslovakia, where imports declined by about 50,000 tons. Romanian imports from Morocco increased to 503,200 tons, compared with 91,000 tons in 1972. Morocco's exports to Latin America expanded by 254,300 tons, most of which went to Brazil and Mexico. For the first time, Morocco exported phosphate rock to Algeria, some 27,500 tons.

Exports to Asia from Morocco increased by over 0.7 million tons. This increase was mainly due to higher shipments to the People's Republic of China, an additional 251,200 tons; to India, an increase of 215,800 tons; and to Japan, an increase of 445,500 tons. Shipments to Lebanon, Taiwan, and Turkey also showed increases. Shipments to Australia from Morocco almost doubled, to reach nearly 60,000 tons.

The disruptive effect of high phosphate rock prices and tight supplies began in 1972 when demand for phosphate rock exceeded production, and stocks were reduced to the practical irreducible limit. Modest price increases of $1 to $1.50 per ton were made in 1972 and early 1973. In October 1973, Morocco increased its price from $15 to $42 per ton for 75% BPL grade rock. Of interest is the combined effect of higher rock prices and concurrent accelerating freight rates on the delivered price of Moroccan phosphate rock in Belgium, the Netherlands, and India, in the early 1972 and late 1973–early 1974 periods. In early 1972, 75% BPL rock was delivered to Bel-

gium and the Netherlands for $14.55 per ton and to India for $19.10 per ton. In late 1973–early 1974, the price in Belgium and the Netherlands was $48.50 per ton, and in India it was $76 per ton.

It is probable that the high prices for phosphate rock will encourage the OCP to expand production and exports. OCP plans to produce and sell 19.5 million tons in 1974 by utilizing all available capacity and reducing stocks to a minimum. Future plans call for production to reach 25 million annual tons by 1977. The expansion will be accomplished by increasing the productivity at OCP's two existing mining complexes—Khouribga and Youssoufia.

Khouribga's open pit mines at Sidi Daoui and Meraa el-Arech produce two-thirds of Morocco's output. These mines are already mechanized and output will increase only by 9% over the next 4 years. Two new drying plants will be added at Khouribga to process Layer II ore.

At Youssoufia, a long-wall mechanized mining system has been installed in one of the two underground mines. The other mine's ore bed is too uneven to use this system. When the "black phosphate" is mined at Youssoufia within a few years, a long wall system will be installed. The black rock contains organic material and 18% to 20% water. Reserves of black phosphates have been estimated to exceed 230 million tons and will be the basis for Youssoufia's production in future years. The rock after calcining will range from 67% to 75% BPL.

A pilot calcination plant for the Youssoufia complex is expected to be operable in 1975. If successful, OCP plans to order two additional calcining kilns. The three calcining kilns will have a capacity of 1.2 million tons and all will be onstream in 1978. This production will be consumed by "Maroc Chimie" and OCP's projected new phosphoric acid plants, "Maroc Phosphore I and II," each with a capacity of 1,000 tons per day P_2O_5, located at Safi.

OCP has announced a number of new projects associated with phosphate rock. An open pit mine is planned at Ben-Gueria near Marrakech. The deposit covers 12,000 hectares, has six layers of medium-quality rock (68% BPL average), and if the schedule is maintained, production will start in September 1977 at an annual rate of 1 million tons. By the mid-1980's production will rise to 5 million tons annually and to 12 million tons by 1988.

Another open pit mine is planned for Sidi Hajjaj, east of Khouribga. Production is scheduled to start in 1980 and reach 10 million tons per year in 1990. The product will range from 75% to 82% BPL.

The Mescala deposit near Essaouira is being explored with U.S.S.R. assistance.

The first preparations are being made to construct a 6-million-ton annual capacity washing, drying, and shipping complex at Oued Zem to handle Khouribga ore in 1977.

The Government of Morocco is planning a third major port at Jorf Lasfar 10 miles south of El Jadida on the Atlantic coast. The new port will be needed to supplement the export capabilities of Casablanca and Safi. It will be capable of handling vessels of up to 100,000 tons displacement. Operation is scheduled for 1979.

MINERAL FUELS

Coal.—The price of coal in Morocco was permitted to rise 35% for the first time in years, indicating that the Government of Morocco intends to continue to operate the anthracite mine at Jerada. This coal mine is difficult to work from its 450-meter shafts and highly faulted 35- to 70-centimeter veins. Progress has been made to improve productivity, and with the increase in coal prices the mine should operate profitably. Reserves of minable coal are uncertain. Estimates of from 20 to 40 million tons have been made, but the limited local markets will restrict production. Production in 1973 was 565,000 tons. A modernization program in a new gallery and a new crushing plant were completed in 1973. By 1977, production will increase to 380,000 tons to fuel an adjacent powerplant, for burning in sugar mills, and for home heating.

Natural Gas.—A production increase at the Société Chérifienne des Pétroles (SCP–50% BRPM and 50% French ownership) principal field near Esaaouira raised output to 65 million cubic meters in 1973. Before the new gasfield in the Gharb can be exploited, a pipeline to Kenitra must be completed. The reserves of natural gas, estimated to be about 750 million cubic meters, will continue to be used at the Youssoufia phosphate rock mines but do not represent a large energy source for the future. Morocco will import Algerian gas by pipeline to fuel a number of industrial

projects in eastern Morocco and the new steel mill at Nador.

Oil Shale.—There are several known deposits of oil shales. In addition to a promising deposit at El Borg near Tangier and Tarfaya, the most important is near Timahdit, about 40 kilometers south of Azrou in the Middle Atlas Mountains. The increased price of crude oil has stimulated interest in the oil shales. Studies completed indicate that the shale at Timahdit is a 30-meter-thick section extending 20 kilometers to the south. The formation contains an estimated 5 to 7 billion tons of rock averaging 10% oil and 3% sulfur. BRPM plans to make further geological and extractive process studies in 1974.

Petroleum.—Morocco's small petroleum wells, operated by SCP, produced 42,000 tons of crude oil in 1973. Unless new commercial finds are made, crude oil production will probably end within a few years. Almost all of the crude oil refined in Morocco is imported from the U.S.S.R. and Algeria. Each country supplies about half of the 2.5 million tons imported annually. Diversification of suppliers will be a goal in 1974 when Iraq, Iran, Kuwait, and Saudi Arabia will ship oil to Morocco. A third oil refinery, the Mohammedia, is planned for Casablanca. This additional capacity (2.5 million tons per year) will give Morocco a total refining capacity of 5.8 million tons per year in 1977. Although the pace of oil exploration did not change in 1974, it is expected to markedly increase in future years. Burmah Oil Ltd. is conducting seismic studies in a 10,000-square-kilometer area beyond the 200-meter depth between Tangier and Rabat. BRPM discussed other Atlantic deep water permits with foreign concessionaries, and new activity is expected offshore from Agadir-Tarfaya. There is interest in unexplored areas along the Mediterranean coast, but granting concessions is complicated by the question of jurisdiction over seas adjacent to the Spanish-held enclaves of Ceuta and Melilla. BRPM conducts most all oil exploration onshore. Seismic work and core drilling continued in the Doukkala Region and between Beni-Mellal and Khouribga. Other areas are to be prospected within the next few years where prior prospecting showed some promise.