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OFFICE FOR THE CARIBBEAN

INVENTORY OF
MINERAL RESOURCES IN CDCC COUNTRIES

TABLE OF CONTENTS

LIST OF EXPLANATORY NOTES TO SYMBOLS AND ABBREVIATIONS

oz	- ounce
cu.yd.	- cubic yard
dwt.	- pennyweight
ft.	- foot/ft.
tons	- long tons (2,240 pounds/(lbs.)
lb(s)	- pounds (avoirdupois)
MT	- metric ton
m	- metre
km	- kilometre
LDT	- long dry ton
M	- million (10^6)
...	- not available
-	- nil
billion	- one thousand million
g	- gramme
e	- estimate
p	- preliminary
neg	- negligible
E	- ECLA estimate
mfrs	- manufactures
SITC (R)	- Standard International Trade Classification (Revised) (United Nations)
UNDP	- United Nations Development Programme
CDCC	- Caribbean Development and Co-operation Committee
IBA	- International Bauxite Association
ALCOA	- Aluminum Company of America
JAMALCAN	- Jamaica Alcan Aluminum Limited
ALPART	- Aluminum Partners of Jamaica Limited
SURALCO	- Suriname Aluminum Company

JAMALCO	- Jamaica Aluminum Company
DEMBA	- Demerara Bauxite Company
BIDCO	- The Bauxite Industry Development Company Limited
GUYBAU	- Guyana Bauxite Company Limited
BERMINE	- The Berbice Mining Enterprise Limited
COMECON	- Council for Mutual Economic Assistance

INTRODUCTION

The countries constituting the Caribbean Development and Co-operation Committee (CDCC) are still basically producers of primary goods (agricultural and mineral commodities). While land is still relatively abundant in the area taken as a whole, the volume of mineral resources (so far as is known) is relatively scarce, with a few exceptions, notably hydrocarbons (severely limited presently to four countries), bauxite (more widely distributed) and a few less important minerals including the construction minerals. However, it should be noted that there appears to be a considerable amount of unexplored potential. Economic development efforts would of necessity have to focus largely on utilising indigenous resources to the best advantage. It is in this context that the First Session of the CDCC stressed the importance of a "better knowledge of indigenous raw materials, with a view to their industrial utilization". 1/

The purpose of this document is essentially in partial fulfilment of a specific directive that emphasis of the Work Programme of the CDCC in Natural Resources should be on mining.2/ A necessary first step in the task assigned the Secretariat is to comprehend the nature and quantum of these resources, their locations, possibilities of further discoveries etc. Considerably more detailed data, including information on existing and planned initiatives of governments and organizations are of course required in order to complete even this preliminary stage.

Unfortunately, work in this area cannot proceed as rapidly as desired since resources available to the Secretariat for this sub-project are limited. The Secretariat has been assembling data and establishing contacts in countries and among national and international agencies. Data utilized in preparing this report have been collected over a period of more than two years from the documentation resources of the CDCC library, from resources of other libraries and from data provided to the Secretariat staff during field visits (missions).

1/ Report of the Caribbean Development and Co-operation Committee, Havana, Cuba, 31 October - 4 November, 1975 (E/CEPAL/1010).

2/ Report of the Second Session of the Caribbean Development and Co-operation Committee, Santo Domingo, Dominican Republic, 16-22 March 1977.

Questionnaires have been left with appropriate government departments in several countries but responses to these have been very limited and/or incomplete. The gaps in the data will be easily observed by officials and others familiar with the subject in the various countries.

The main part of the document is an "Inventory" which consists of a number of tables showing a range of mineral resources 3/ data by country including occurrences, location, estimated reserves, etc. It will be observed that this kind of information relating to most minerals are lacking for many CDCC countries.

An Annex titled Background Notes constitutes the minor section of the paper. The largest part of this Annex deals with bauxite, copper and ferronickel. Apart from the construction minerals (earth and stone) and salt, most of the other minerals appear to be limited to few countries only.

Data on production, extraction, quarrying, etc. of crude minerals are shown in the Annex—Table 8. An obvious deficiency of these tables is the fact that the data are not current (most relating to 1975 and earlier). It will be observed too that data are not available for some countries and that one or only a few country names appear under some minerals. Value of import and export data for certain broad categories of minerals are given for some countries as it was not possible to secure these data at a more meaningful level of detail.

This document is a revised version of the document "Preliminary Draft Inventory of Minerals in CDCC countries "(CARIB/INT/80/3). The revision is less comprehensive than was hoped. Many countries still have not responded to the Secretariat Questionnaire and other requests for data. In some cases data are unavailable. It is a fact that there is great need for more comprehensive exploration. There are also indications that archival records relating to mineralogy are very inadequate in some countries. Search and acquisition of such records where they exist would be a useful step in mineral exploration and development in these countries.

3/ Fossil Fuel resources are excluded. These were covered in document E/CEPAL/CDCC/65 dated 28 May 1980.

THE INVENTORY TABLES

LIST OF INVENTORY TABLES

TABLE 1

COUNTRY: ANTIGUA

MINERAL RESOURCES DATE

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
CLAY	Underlying limetsone region	Bellevue St. Claire ...		...	Used in Pottery Industry Production data given in Table 8 of the Annex.
LIMESTONE	North-east of line joining Wetherell Point and Willoughby Bay. Bounded in the south by a broken scarpment.	...	...	...	Most of limestone quarried is used locally.
OTHER MINERALS	...	...	...	...	No data is available to date on other mineral indication activities.

Source: No. 18 of List of References

TABLE II

COUNTRY: BAHAMAS

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON METALLIC					
ARAGONITE	Found in association with coralline limestone, the basic geological formation of the islands	Sandy Cay, some 50 miles off the Florida Coast.	...	...	During 1970, an agreement for the exploitation of this deposit was made between the Government and a commercial interest, to cover a period of 20 years. Production data given in Table 8 of the Annex.
SAND AND GRAVEL	...	...	...	...	Production data not available to date.
SOLAR SALT	...	Inagua	...	...	Produced by Morton Bahamas Ltd., in Inagua one of the world's largest solar salt complexes.
OTHER MINERALS	...	...	...	...	Data on the presence and economic feasibility of other minerals are unavailable.

Source: No. 8 of List of References

TABLE III

MINERAL RESOURCES DATA

COUNTRY: BARBADOS

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
LIMESTONE	Eighty percent of surface area comprises coral limestone, through which water percolates easily to extensive underlying clay beds.	St. Andrew District	...	...	Limestone is used for a variety of purposes ranging from coral building blocks to agricultural lime. Surplus is exported.
SANDSTONE, CLAYS AND MARLS	Found in a north-east extension of the surface limestone, and also in the underlying areas.	St. Andrew District	...	...	Used mainly in the pottery industry. Some is exported.
OTHER MINERALS	...	...	...	...	Data on presence and economic potential of these minerals are not available.

Source: No. 8 of List of References

COUNTRY: BELIZE

TABLE IV

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
COPPER	...	...	...	...	Prospecting in the Maya Mountains during late 1960's showed no economic finds.
GOLD	Sporadic alluvial occurrences.	Eastern Branch (Macal) of Belize River and several small creeks draining southern parts of Maya Mountains. Only deposits of economic interest found in tributaries of Ceibo Grande River.	2 dwts/cu yd to 7 dwts/cu yd gravel.	...	
LEAD	...	...	...	...	Results of prospecting carried out in latter half of 1970's in Maya Mountains unknown. Some indications of economic deposits.
MOLYBDENITE	...	...	...	...	Presence identified since late 1800's and confirmed in the 1950's.

COUNTRY: BELIZE

TABLE IV (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
MONAZITE	...	...	...	...	Presence identified since late 1800's and confirmed in the 1950's.
SILVER	...	...	...	...	Results of prospecting carried out in latter half of 1970's in Maya Mountains unknown. Some indication of economic deposits.
TIN	Traces of widespread occurrence found as cassiterite, associated with granite.	Mountain Pine Ridge: Prevassion Creek and Little Vaqueros Creek.	4 1/2 oz/ton to 6 oz/ton gravel (1 ton = 3/4 cu.yd)	...	London Tin Corporation carried out exploration in 1952. No success. Prospecting done under licence by private company in 1975-80 in Maya Mountains. Indications of economic deposits.
ZINC	...	...	...	...	Prospecting in the Maya Mountains during late 1960's showed no economic finds.

COUNTRY: BELIZE

TABLE IV (Continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
BARYTES	Abundant, associated with zone of quartz containing 21.74% to 21.78% Magnesia.	First Creek. Best deposits in 2 veins 5 ft. and 10 ft. thick, extending for distance 800 ft. - 1,000 ft . Depth unknown.			Prospecting carried out in first half of 1950's.
BUILDING MATERIALS (SANDSTONE SLATE)	Flagstone; sandstone	Toledo Series, Macal Series (Maya Mountains)		No estimate made.	Abundant and readily available.
		Maya Series (Soldier Creek and Silver Creek)		No estimate made.	
CLAY	Abundant	Coastal pine ridge areas.		No estimate made.	Few tests carried out.
CORAL	"Pipeshank" - fragments of coral with greyish mud.	Shallow water close to cays.		No estimate made.	Tests made since 1940. Used extensively for reclaiming mangrove swamp around Belize City. In crude State, possesses no hardening properties and valueless as building material unless treated with lime and dried. Treated pipe-shank mixed with Portland cement gives product suitable for building purposes.

TABLE IV (continued)

COUNTRY: BELIZE

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
DOLOMITE	Abundant	Principal deposits: Punta Gorda, St. Margaret Creek.	Est. 300-400 ft. 200 ft.	400-500 ft.	Both areas quarried for road metal.
GYPSUM	Thin Beds	Near Cays along Belize and Mopan Rivers.	...	...	
LIMESTONE	Abundant. Very pure and almost completely soluble in dilute hydro-chloric acid. Usually contain little or no magnesia.	Over 60% of country underlain by limestone.		Inestimable.	Quarrying being done at Rockville and near Stann Creek. Crushed aggregate used in road building.
SILICA	Abundant	(1) 5 mile quartz reef forming crest of quartz ridge at Source of Rio Grande (2) Alluvial quartzite sands in vicinity of Stann Creek and Punta Gorda.		No estimate made of quality or quantity.	

Source: See No. 1 of List of References and data supplied CEPAL.

COUNTRY: CUBA

TABLE V

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
CHROMIUM	...	Moa-Baracoa area	2.0×10^5 tons (total)	...	Ore deposits vary in size from small knots to bodies containing extensive deposits of the ore. This ore contains iron and oxygen.
COBALT	...	Moa Bay	...	...	This metal is recovered as the sulphide during the extraction of nickel.
COPPER	...	Pinar del Rio Province (Matahambre mines)	...	...	A sizeable vein of copper reportedly discovered between Santiago de Cuba and Camagüey. Development should have commenced by 1977.
IRON ORE	Found in combination with nickel.	Sierra de Nipe.	3.5×10^9 MT (total) 1965 *1	...	Reserves are immense, but problems of extraction and purification due to contamination of nickel, cobalt, alumina and chrome.

*1 : Mining Annual Review, 1980 gives estimated reserves of Literite and Magnetite at 7×10^9 MT and 1×10^9 MT respectively.

COUNTRY: CUBA

TABLE V (Continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
MANGANESE	...	Mines exist in area south of Bayamo in the Charco Redondo area.	...	...	Problems with manganese mining stem from the low-grade nature of the ore, its location in small pockets, high transportation costs and a shortage of concentration facilities.
NICKEL	...	Oriente Province mainly.	19 x 10^6tons (1972)	...	Deposits have an assay of 0.8% - 1.7% and are also an important source of iron, chromium, cobalt(0.1% - 0.14%) and manganese. Reserves of nickel are among the largest in the world. Extraction of metal is an expensive and involved operation, due to contamination with other metals.
OTHER METALS	...	...	...	...	Zinc, silver, gold have been produced on a very small scale, in association with the mining of other metals. Tungsten and antimony are known to exist, but deposits appear too small to provide a basis for production on a significant scale.

COUNTRY: CUBA

TABLE V (Continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
LIMESTONE	A range of low-grade to high-grade marble.	Isle of Pines Oriente Province to a small extent.	Virtually Inexhaustible	...	Cuba's limestones are of good quality, with an inexhaustible supply of clays with the exception of high-grade refractory types of bauxite. The combination of clays and limestones has made Cuba virtually self-sufficient in basic building materials.
OTHER MATERIALS	...	...	...	...	Gypsum deposits are found in Matanza, Camagüey and Oriente Province. Coral Sand rich in calcium carbonate is abundant along the coast. Sulphur, barite and magnesite are also known to exist. Silica sand.

Source: Nos. 17 and 18 of List of References.

COUNTRY: DOMINICA

TABLE VI

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
BAUXITE	...	...	...	...	Samples mainly from road cuts and other more accessible locations classified as "siliceous ferruginous" clays. Few samples taken from higher elevations.
BLACK SANDS	...	On some of the beaches magnetic concentration, greatest on windward side.		Unknown	Vague possibility of iron and titanium appear to exist. Requires further detailed study.
COBALT	Thermal springs excrustations.	Valley of Desolation/ Boiling Lake area.		Unknown	...
NON-METALLIC					
PUMICE	Found in layers up to 200 ft. in depth and well distributed particles from fine dust to boulders. of volcanic origin of a cellular glassy structure.	Rockaway, Canefield, both in the parish of St. Paul	...	...	Has a number of commercial uses including its incorporation in concrete structures where its lightweight and thermal insulation properties are most valuable; as a finely ground pozzolanic additive for use in hydraulic cement; as soil-conditioner. Pioneer status was granted to the Dominica Mining Co. Ltd. in 1964 in relation to the mining and processing of pumice and pumiceous material. Production data given in Table 8 of Annex.

COUNTRY: DOMINICA

TABLE VI (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
SAND AND GRAVEL	...	...	...	...	Production data given in Table 8 of Annex. Other data unavailable.
OTHER MINERALS	Diverse	...	...	...	Volcanic nature of island suggests metallic mineral occurrence possible. Samples indicate presence of copper, zinc, lead, gold mercury and silver but of low values. Native sulphur deposits may be more common. Most notable occurrence at Soufrière.

Source: No. 18 of List of References.

COUNTRY: DOMINICAN REPUBLIC

TABLE VII

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
BAUXITE	White, red and grey deposits found in different locations.	Padernales zone; south-east of the Sierra de Bahoruco and in the N.W. region.	17×10^6 MT (measured)	6×10^7 MT (speculated)	
COPPER	Rock formation here is exclusively from the Duarte formation, which is heavily faulted.	Mata Grande	...	...	i) Zones from 5 - 8mm thick of copper oxides, with a copper content of 0.5%. Better veins contain as much as 1% to 3% copper. Drillings to evaluate the potential of the region have not been effected.
	Associated with the faults of the Loma Búcaro.	San Francisco	...	...	ii) Copper deposits in this region were exploited on a small scale at the beginning of the century. Reserves and assay of copper are not known.
	Rocks are from the Upper Cretaceous period corresponding to the 'Tireo' Formation and the mineral appears to be in contact with the different intrusive bodies of the Cordilleras.	Cordillera Central.	...	...	iii) This area, under concession to a foreign company, covers the Mata Grande Area, Carmen, Pinar Bonito. The deposits are associated with veins of quartz, chalcopyrite and pyrites. However studies already done, cannot define the metallic bodies or reserves. In this district copper deposits of an assay of 2.8% and 12% copper have been located.

COUNTRY: DOMINICAN REPUBLIC

TABLE VII (Continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
COPPER (cont'd)	Positive indications from the volcanic rocks of the Tireo formation associated with small intrusives, perforated with quartz.	Las Cañitas	...	...	iv) 23 indications of copper have been found here in the Tres Piezas, Larkesita and Las Ayunias zones. The minerology is chalcopyrite, gold malacite, azunite. Geographical and geochemical studies are being carried out here in order to make an initial evaluation of the mineralization of the area.
ALLUVIAL GOLD	...	Bulla Miches	...	...	Possibility here limited. Explored on a small scale for quite some time. Found dispersed in an intensive area north of the Cordillera Oriental and in Lake Redona. This could be source of the deposits of Upper Cretaceous Period.
GOLD/ SILVER	Oxide Ore	Pueblo Viejo	15 Mill, M.T. dry basis		The Pueblo Viejo concession of the Rosario Dominicano (mining company) now wholly owned by the Government (1979/80) assays at about 3.94g/MT gold and 22.96g/MT silver in 1979.

COUNTRY: DOMINICAN REPUBLIC

TABLE VII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
GOLD/SILVER (cont'd)	Sulphide Ores	Pueblo Viejo	23 Mill, MT dry basis.		
		Los Cacaos Monte Negro	...	10 MILL MT (probable)	Grades are thought to be only marginally lower than at Pueblo Viejo concessions. (see also under Nickel).
IRON	Associated with diorites	North and South of Hatillo	10×10^6 MT (probable) 43×10^6 MT (possible)		Found as magnetite veins (90%) haematite (10%) 700×10^3 MT extracted to date (1978). Reserves appear to be small.
MANGANESE	Positive indications in several areas.	North-east of Padre Las Casas, and South-east of Hato Mayor.	...	...	Contains 48% manganese and 1.1% silica. There exists an area on the Nagua zone, 10km long and 50m wide where the manganese deposits are found occurring with magnetite, ilmenite, epidite, zircon and topaz. At the mouth of the Rio Yagru del norte is found 100 km^2 of this ore.
MOLYBDENUM	Positive indications.	Zone of Madrigal	quartz deposit	1m thick	Extent, reserves and quality are not known. Contains calcite deposits.
NICKEL	Associated with ultrabasic rocks of the Middle to Upper Cretaceous Period. Occurs also in high zones where moderately faulted.	Pueblo Viejo	67×10^6 tons (short) (1975)	25×10^6 tons (short) (1975)	Assay of 1% to 2% nickel containing 16% to 20% Fe_2O_3 (Co, Cr, to a lesser extent).

COUNTRY: DOMINICAN REPUBLIC

TABLE VII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NICKEL(cont'd)					Reserves are expected to increase with additional exploration activities.
		Pueblo Viejo	25 x 10^6MT (1976)	21.2 x 10^6MT (1976)	Being explored by a local company. The upper oxidized level of this deposit, was joined by the volcanic sedimentation of the Los Ranchos Formation.
		Cacaos	(25.3×10^6MT) (oxides)		Oxide here contains silver (25.1g/MT) and Gold (4.06g/MT) and sulphur.
			10.6 x 10^6MT (sulphides)		With more exhaustive exploration, zones of greater richness may be found.
	South East of Hatillo	Loma La Mina	Est. (6.0×10^6MT)		Ten borings done here, but still insufficient. More need to be done.
			(104×10^3MT) sulphides		Given the geology, it may be possible to find more reserves below Hatillo faults. Investment needed to verify composition.

Source: See No. 8 on List of References.

COUNTRY: GRENADA

TABLE VIII

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON METALLIC					
LIMESTONE	Occurs in few outcrops, with changes in both land and sea levels.	...	...	...	Most of this material is used locally. Production figures given in Table 8 of Annex.
SAND AND GRAVEL	...	...	...	...	Production data not available to date.
OTHER MATERIALS	Most of island is of comparatively recent volcanic origin, overlaying sedimentary shales of an earlier geological period.	...	...	...	Outcrops of shale appear at numerous points of the island, the largest being at Lavera. The volcanic nature of the island would suggest the presence of other materials whose data are not known or unavailable.

Source: No. 18 of List of References.

COUNTRY: GUYANA

TABLE IX

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
BAUXITE	Deposits found in a north-west south-east belt, 8-40 miles wide and some 180 to 220 miles long.	Linden Ituni Kwakwani	130-150x10^{6}MT (1977)	Several billion tons including laterites (hypothetical)	Laterites are widely distributed in Guyana. Both aluminous and iron-rich types exist. Some laterite is quarried and used in bauxite production and as road metal. Other laterites are found extensively occurring in the west of the country in the Pakaraima Mountains, where they extend for several hundred square miles.
CHROMITE	Disseminated mineralization	Coral Stone Creek	...	...	Low and sub-economic grade.
COLUMBITE TANTALITE	Derived from complex pegmatite dykes, now almost completely eroded.	Mazaruni Area	...	...	Alluvial mining of columbite commenced in 1952 and stopped in 1957.
COPPER	Disseminated chalcopyrite and small amounts of native copper in gold workings, associated with high grade metamorphic rock.	Greote Creek - Aremu - Peter's Mine Division and Haimaralli Areas in Northern half of country.	...	18x10^6 tons	Isolated samples have assayed up to 2% copper, while reserves have an assay of 0.26% Cu, and a greater amount of lower grade material.

COUNTRY: GUYANA

TABLE IX (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
GOLD	Mainly alluvial and eluvial deposits.	Widespread, concentrating in the following areas: Potaro, Mazaruni and North West. Few occurrences are known in the south.	...	...	High density of gold. Present development of deep-seated deposits under consideration. Investigations at Honey Camp (Kaburi-Issano-Karanang Division) showed the presence of gold in significant amounts. Further work to be carried out at surface and depth to ascertain grades more reliably and to determine the most suitable mining methods.
IRON	Iron-oxide rich rocks of magmatic and possibly sedimentary origin.	Northern and Southern Guyana.	...	...	The main drawbacks for using this material are the high titanium and phosphorous content. The magnetite - haematite concentrations of the southern occurrences are of high grade Fe, but deposits are too small and non-persistent at depth. (See also under Laterite)
LATERITE (FERRUGINOUS ALUMINOUS)	Iron ore potential, found in mountains where they extend over several hundred square miles.	Concentrated in the region of the West Pakaraima Mountains, and in association with bauxite deposits.		Several million tons material (hypothetical)	Processing depends on availability of cheap energy. Some laterite is quarried and used in bauxite processing, and apart from its use as a road metal, no other use is made of it. Laterites have the potential of producing both iron and aluminum but suitable technology to mine economically was lacking at the end of the 1970's.

COUNTRY: GUYANA

TABLE IX (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALIC					
MAGNESITE	Occurs in association with untra basic rocks. Believed to be a secondary residual product from weathering of the ultrabasics.	South Rupununi Savannah	...	...	Resources are too small to consider economic exploitation.
MANGANESE	Main occurrences are in an east-west belt, 10 miles wide and 40 - 50 miles long in the North-West district.	North-West District.	318×10^3 tons (Matthew Ridge)	...	First noted in 1903, production started in 1959. Mining discontinued in 1969. Reserves at Matthew Ridge have assay of 37% Mn, while those in Piapiani area have 42.5% Mn content. The rocks are deeply weathered and the manganese ore comprises various oxides and silicates including SiO_2 and Al_2O_3.
MOLYBDENUM	Limited deposits of molybdentite in Porato district.	(a) Eagle Mountain	$25\text{-}40 \times 10^6$ MT at 0.1% Mo plus, to depth of 600 ft.		Does not appear to warrant expense of further drilling. Gold is associated with molybdenite and abortive attempts at hardrock gold mining are widespread in this area. No significant mineralization.
		(b) Dickman's Hill	...	...	Low grade quartz porphyry body also found in association with molybdenum.

COUNTRY: GUYANA

TABLE IX (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
NICKEL	Lateritic clay overlain by laterite and underlain by ultra-basic rock.	Blue Mountains in the North-west district.	...	10-20 x 10^6 tons	Carries approx. 1% nickel.
RADIOACTIVE MINERALS	Haphazard distribution of Monazite. Minor Euxenite	South Rapununi Savannahs Kanuku Mountains	...	...	Other uranium bearing radio-active minerals have been reported in the Bartica Assemblage type rocks. The most promising area appears to be in the Roraima Formation. Several agreements have to be signed with foreign companies to explore for uranium in Guyana.
TUNGSTEN	Metal occurs in scheelite.	Two areas in the country.	...	...	Associated with gold mineralization in both cases. Random samples assayed high grades of the metal, however occurrences appear too small to be commercially exploitable.
NON-METALLIC					
AGATE	Consisting mainly of banded and "fire" varieties	Rapununi - Best values obtained at Bonne Milee near Sunnyside on the Ireng River, 31 miles north of Lethem.	0.85 lb/ton Should yield about 373,000 lbs.	...	...

COUNTRY: GUYANA

TABLE IX (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
BUILDING STONE	Bedrock consists partly of granite and to some extent gabbro.	Concentrated around Bartica within 25 miles of the Essequibo and Mazaruni Rivers.	125×10^6 MT	...	
DIAMONDS	Spatially associated with the Pakaraima Mountain block of flat-lying sandstones and conglomerates in west of country.	Concentrated in Potaro, Middle Mazuruni, Cuyuni and Rupununi areas.	...	...	Work being done on diamond and gold reserves by a Foreign Company in the Mazaruni Basin during 1975.
GRAPHITE	Limited	Popekai on the Cuyuni River about 52 miles north-west of Bartica.	...	...	Unlikely that occurrence is of economic value.
KAOLIN	Extensive deposits associated with bauxite belt.	In the Linden-Ituni area, the bauxite overlies the kaolin.	7×10^6 MT	300×10^6 MT	Work carried out in the Ituni area at two locations between 1972 and 1973. Guyana has plans for exploiting a small but high quality 3×10^6 MT k kaolin deposit at Ituni. Plans are underway for setting up a 140,000 MT/annum kaolin processing plant. Analysis of raw material compare favourably with English China Clay and Georgia Kaolin.
KYANITE	Limited deposits.	Near Upper Supenaam River.	0.40 tons/cu.yd to 0.41 tons/cu.yd.	...	Economically interesting amounts.

TABLE IX (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
QUARTZ	Large clear alluvial crystals have been reported in diamond workings.	Highest frequency of occurrences, associated with the Pakaraima Mountains block and immediately east of the escarpment.			Analytical work needs to be done on samples. These crystals are being considered for use in optical glass, electronic and other industries.
SAND	Abundant	Over 5,000 sq. miles, north-east section of country, covered by deposits of brown and white sand, 200 ft. thick.	virtually	inestimable	The white sand is suitable for glass manufacture. Preliminary examinations and clearing of a site for the construction of a glass factory is underway.
TALC	Talc and soapstone resources.	North-west District.		0.6×10^6 MT	The grade appears to be good, the main impurity being magnesite with some antigonite and chlorite.

COUNTRY: HAITI

TABLE X

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCE		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
BAUXITE	Geology of area comparable with that of deposits found in Jamaica and Dominican Republic.	...	$5x10^6$ MT (1975)	...	Since 1974 field investigations have been carried out to assess the bauxite potential. The ore is exported without further processing.
COPPER	...	"Meme" close to Gonaive.	...	...	Ore found in this region contains 28 - 30% copper. 200 km of this area was under exploitation until 1972. Other copper deposits found but of uneconomic copper content.
SILVER	...	...	...	...	Some silver ore found. Assay of ore suggests that it is uneconomic.
OTHER MINERALS	...	...	...	...	It is known that Haiti possesses considerable mineral resources largely undeveloped. Type and quantity data are not known. Technical co-operation agreements between Haiti and Federal Republic of Germany signed during 1979 covers study of lignite deposits in Maissade region. Exploration for base metals carried out in recent years.

Source: No. 8, 18 of List of References.

COUNTRY: JAMAICA

TABLE XI

MINERAL RESOURCES DATA

MINERAL	OCCURRENCE	RESERVES	REMARKS
A. ECONOMIC RESOURCES			
1. Metallic Ores - Bauxite	Red bauxite: mainly in St. Ann and Manchester plateaux and St. Catherine. Yellow Bauxite: mainly in St. Elizabeth North Manchester and Clarendon.	Total Reserves 2×10^9 MT	Six active mining areas exist, and four operating, and one inactive alumina plant (as of early 1978).
2. Industrial Minerals			
i) Sand and Gravel	Major river valleys in central and eastern Jamaica.	Limited	Industrial well developed for local use. Shortages of natural sand exist in western Jamaica.
ii) Limestone		Unlimited	Mainly used in the alumina industry to remove phosphorous. Major potential exists for manufacture of plasters for export and local needs, also for manufacture of metallurgical lime. Possibility for use in manufacture of soda ash, which is used in the production of glass and alumina. Used in terrazzo tile manufacturing.
a) Special Varieties Industrial Lime	Widely distributed in White Limestone areas.		
Whiting	Brown's Town, St. Ann; Lethe, St. James: Good possibility on fringes of bauxite deposits in St. Thomas.	Unlimited. Indicated 10×10^6 MT in Brown's Town	Potential in paint, toothpaste and fillers. Pre-investment feasibility study to be started shortly (1978) for Brown's Town deposits.
b) Common Varieties Aggregate	Widely distributed in Limestone areas.	Unlimited.	Industry well developed, supplying material for construction industry. However, specifications and reliability of grades, particularly for high strength aggregate, need to be stressed more.

COUNTRY: JAMAICA

TABLE XI (continued)

MINERAL RESOURCES DATA

MINERAL	OCCURRENCE	RESERVES	REMARKS
Grit and Rock Flour		Adequate	Further use needs to be made of this by-product. Bauxite companies, particularly Alpart, have unused stockpile because questions of tax concessions etc. arise. Study of cement - lime block warranted.
Cement Manufacturing	Limestone and shale areas of eastern and western Jamaica.	Adequate	Purity of limestone sometimes makes selection of limestone for cement manufacturing problematic.
Building Stone	Limestone areas.	Unlimited	Costs of cutting and laying stone presently restrict use.
iii) Marble	Serge Island to Hibernia, St. Thomas	Adequate	Industry has operated on too-small scale. However, there are 25 years local experience in the production of cultured marble and terrazo tiles and related products. Potential exists for a large-scale multi-product marble industry for local use and export and also supporting a labour-intensive craft industry.
iv) Gypsum	Bull Bay area, St. Andrew and St. Thomas	Measured 2.7×10^6 MT. Indicated and inferred 18×10^6 MT (70% gypsum)	Present mining practices need to be drastically revised to stop high grading which has seriously depleted reserves. It is proposed that different grades of gypsum should be produced for different uses by blending from different stockpiles. Local use of gypsum and plaster minimal, but potential exists for developing plaster and related local market.

COUNTRY: JAMAICA:

TABLE XI (continued)

MINERAL RESOURCES DATA

MINERAL	OCCURRENCES	RESERVES	REMARKS
v) Silica Sand	Black River area, St. Elizabeth	Inferred reserves 1×10^6 MT	Present consumption is 9,500 tons per annum for use in the glass container industry. Upgrading of production by removal of iron materials warranted. Similarly, the use of the fines etc. is necessary.
3. Precious and Semi-Precious Stones	Rio Nuevo and neighbouring areas, St. Mary	Adequate	Basis of present semi-precious jewellery industry. There is an excellent export market associated with tourists. This industry needs encouragement because it is labour-intensive, but quality of products must be guaranteed.
B. POSSIBLE RESOURCES			
1. Industrial Minerals			
i) Clays	Frenchman's and elsewhere; Jobs Hill, St. Mary	200×10^6 MT	Potential exists for structural ceramics, wall tiles and expanded craft ceramics industry. Hard dickite suitable for polishing for crafts.
ii) Dolomitic Limestone	Port Henderson Hills	At least 150×10^6 MT	Further study of this deposit necessary to determine its true usefulness.
2. Fertiliser Minerals			
i) GAT Phosphates	Limestone Caves	80,000 MT	Evaluation of grade and quality of reserves indicate little potential.

COUNTRY: JAMAICA

TABLE XI (continued)

MINERAL RESOURCES DATA

MINERAL	OCCURRENCES	RESERVES	REMARKS
ii) Guano	Pedro and Morant Cays	30,000 MT	
C. SPECULATIVE RESOURCES			
i) Copper	Bellas Gate area, Clarendon etc.	Showings only	Fair prospect; study underway.
ii) Black Sands	Alligator Pond Area, St. Elizabeth		On-shore reserves too small for extractive metal industry. Offshore exploration should be examined in the future.
iii) Iron Ores	Glade Orchard, Mavis Bank, Blue Mountain Area	Inferred 1-3MT	Further exploration needed; there is also the question of accessibility.
iv) Lead-Zinc	Hope Mine, St. Andrew	124,800MT indicated	Exploration needed.
v) Nickel	Ness Castle, St. Thomas	Showings only	Poor prospect.
vi) Manganese	Marshalls Hall, Portlands	Showings only	Exploration needed.
vii) Silver	...	...	Certain samples have shown high assay values in conjunction with copper.
viii) Gold	...	...	Found in conjunction with copper occurrences. Available information suggest that at present high values gold mining might prove feasible as by-product of copper operation.
ix) Radioactive Minerals	Mineral springs in different sections of the island.	...	So far results of investigations are not very promising.

Source: Nos. 1, 2 and 3 of List of References.

COUNTRY: SURINAME

TABLE XII

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
BAUXITE	Bauxitized basic rocks of hinterland; underlaying "Onverdacht Hills" in the coastal plains and usually surrounded by younger consolidated sediments of the Coesewijne, Coropin(and Demerara Formations.	i) Nassau Mts., Lely Mts., Brownsberg and Bakhuis Mts. Adampada-Kabalebo.	...	450-600 x 10^6 MT	Development of reserves in the Western region (Bakhuis mountains, Kabalebo area) has begun.
		ii) Coastal bauxite - near Onverdacht and Paranam also Morengo	...	(partial)	Plans include alumina and aluminum production.
CHROMITE	i) Found as an enclave of ultra-basic schists.	East of Emma Ridge Lawa River.	...	...	Assay of 42-52% Cr_2O_3 with 18% Fe. In the River area, chromite-rich black sand from gold dredging near Benzdorp.
	ii) As float upon chromite bearing ultra-basic rocks found as part of Xenoliths in granitic rocks.	West of the Emma Ridge and upper Toekoemoetoc Creek Saramaaca River.	...	...	Crude estimate of reserves in first 20m of sub-surface of occurrence, 154,000 MT ore. Maximum content of haphazard samples 35.7% Cr. Chromium bearing rocks also found in other areas but deposits appear to be small and of low Cr. content.
CINNABER	Occurring in smaller pieces of weathering clay, probably associated with a small basic plug.	West of Bonidoro on the Marojirne River at the contact of the Paramaka and Rosebel rocks.	...	...	...

COUNTRY: SURINAME

TABLE XII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCE	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
COBALT/NICKEL	Traces in ferruginous laterites. Often the ultra-basic rocks of the old basic intrusives have a slight nickel content.	Majorodam Mountains Dramhoso on the Upper Saramacca River. Also Asbolan at Brokópondo.	...	...	Cobalt and nickel content small.
COPPER	Occur fairly regular in the old basic intrusive and in the basic Paramaka.	Upper Samaracca River, Benzdorp on Lawa River, Upper Tapenahony River.	...	...	Occassionally green oxydic copper minerals are found at surface of Saramacca River. While metallic copper occurs alluvially on the Lawa River. Exploitation done in some areas.
GOLD	Primary gold associated with the contacts of the Paramaka, Rosebel and Armina rocks. Alluvial deposits most productive to date. Eluvial deposits also exist.	Scattered throughout country. Major occurrences Lawa River; East and South East of Lake Van Blommestein towards Marowijne River; North West of this lake, both sides of Saramacca River.	...	...	Gold content variable (erratic) up to 496g/m^3 reported. Gold mining started on a small scale in 1875. Production averaged 30,000 ounces yearly (late 1800 early 1900) but has declined in recent years.
IRON ORE			...	...	
i) Itabirite	Found as enclaves of metasediments. These enclaves are surrounded by granite.	Near Tapajé Creek west of the Paloemeu River.	...	60×10^6 MT	Iron content of this ore varies between 50-70%. The impurities are relatively low.

COUNTRY: SURINAME

TABLE XII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
IRON ORE cont'd					
ii) Laterite-Iron Ore	Originated as a weathering product upon and out of ferruginous rocks of the Paramaka mountains and old basic intrusives.	North-east area of Suriname (Lake Blommestein)	...	i) 2×10^9 MT	Average iron content varies about 34% - 55% in Bakhuis area and 35% in Lake Van Blommestein area.
		North-western area of Suriname (Bakhuis Mountains)		ii) 5×10^9 MT (Ca. 1963)	Because of low iron content and the presence of impurities detrimental to the metallurgical treatment, the development of this resource may probably remain uneconomic for some time.
iii) Titanium Iron Ore	Occurrence in areas built up by the high metamorphic Adampada - Falawatra rocks.	i) Upper Tibiti and Upper Saramacca Rivers.	...	...	High titanium creates a metallurgical problem, for further development of this resource.
		ii) Adampada Creek and Kabalebo River.			
MANGANESE	Associated with metasediments of the Paramaka Formation mainly, but found throughout the country	i) Maripa Hill deposit north east of the former settlement of Dam on the Sara Creek.	...	1×10^6 tonsE	Manganese content - 20 - 30% Mn., though some richer parts occur. The economic significance is decreased by the small reserves and low grade of material (high SiO_2 and/or Fe.)
		ii) Eastern shore of the Van Blommestein Lake.			

COUNTRY: SURINAME

TABLE XII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
PEGMATITE MINERALS					
i) Beryl	Found in a few pegmatites in zonal and non-zonal veins.	At Rama on the Suriname River and on Lower Marowyne River.	...	...	During 1953-55 about 9 tons were produced from 3000m^3 of weathered pegmatite.
ii) Amblygonite	Found in a few pegmatites in zonal veins.	Jorka Creek	...	...	During 1961-62 about 1700 tons of amblygonite were mined by a foreign company. Presently mineral rights are owned by a foreign enterprise.
iii) Tantalite	Occurs in zonal pegmatites in association with other minerals.	Near Jorka Creek.	...	...	This mineral has also been found in alluvial material, near Patamaka - Tempati area and in the De Goeje Mountains in South-Eastern Suriname.

COUNTRY: SURINAME

TABLE XII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
PLATINUM	Alluvial deposits and associated with basic to ultra basic igneous rock types.	Southern slopes of the De Goeje Mountains.	...	...	Found occurring with gold.
RADIOACTIVE MINERALS	Occur in pegmatites of the northern pegmatite belt.	i) Saramacca River near Kwakoegron	...	...	Radioactive monazite and uraniferous opal found here.
		ii) Jai Creek	...	...	At this location, huttonite and cheralite in sand samples were recorded.
		iii) Paloemeui River and in the Makroetoe Creek.	...	...	Certain granite outcrops may be radioactive.
		iv) Kabalebo River (Upper)	...	...	Phosphuranylite - a type of uranium/thorium bearing monazite found in heavy mineral concentrate of water-well samples.
ZINC	Relatively strong geochemical zinc anomalies.	North east of the granulite facies rock structure of the Bakhuis Mountains.	...	...	...
NON-METALLIC					
ABESTOS	Sporadically in the former Afobaka amphibolite quarry.	Marowyne River area.	...	...	i) Vague find of good grade abestos.
		Rama River			ii) Erratic blocks of actindite rock near Rama.

COUNTRY: SURINAME

TABLE XII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
CRUSHED STONE GRAVEL' SAND AND CLAY					
i) Crushed Stone	Conglomerates and the saussurite gabbro, of the Boschland.	Tandee Creek west of the Afobaka and other locations in the interior.	...	...	Crushed stone imported from Trinidad and Curacao for use in the coastal area.
ii) Gravel	Occur in lenses within the upper Coesewijne Sands.	Lower Suriname, Saramecca and Marowijne Rivers.	...	...	...
iii) Sands	Found in Upper Coesewijne Series	Near Lelydorp Lower Suriname River, between Casipora Creek and Berg enDal Demerara Series.	...	...	Reserves of sand in top 1 metre of quartz sand in the Coesewijne belt estimated to exceed 1 x 10^9 M^3.
iv) Sedimentary Clays	On the Demerara and Coropina Series, with Kaolin deposits belonging to the Onverdacht and Coesewyne Series.	Zanderij near Paramaribo.	...	...	i) Clays here are used for ceramic purposes.
		Moengo and Paranam-Onverdacht areas.	...	...	ii) Suitable for the ceramic and paper manufacturing industries.
DIAMONDS	Occur in alluvial material derived from the Rosebel congolomerate. Quartzitic rock from the Upper Coppename River area.	Near Table Mountain. Upper Coppename River, Rosebel - Sabanpasi area.	...	...	Since 1880 diamond finds of gem quality have been reported.
TALC	Old basic intrusives.	West of the Saramacca River.	...	...	

COUNTRY: TRINIDAD AND TOBAGO

TABLE XIII

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
METALLIC					
IRON ORE	Three zones of iron mineralization all of which appear to have lateral continuity of one mile or more.	Maracas Area to La Vigie Ridge. Predominant in the Northern Range.	...	...	Deposits consist of a relatively small low-grade primary magnetite, which comes in two general forms viz. a coarse-textured crystalline variety, common in outcrops but only rarely seen and dense fine-grained variety rarely seen in outcrops but common as floats.
MANGANESE	Ore pellets evenly scattered in the yellow clays which rest on an uneven surface of fresh limestone	Areas of the Aripo Caves and north-west of the Oropouche Caves.	...	...	Estimated that 42 x 10^6 cu.yds. of pellet bearing clay is found in these two areas. Average manganese content is 10.6%. However, manganese content of the washed ore is seemingly not over 5% although surface samples go as high at 15.07%.
PYRITE	Distributed in the phyllites of Northern Range.	Northern Range.	...	...	...

COUNTRY: TRINIDAD AND TOBAGO

TABLE XIII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON METALLIC					
ASPHALT	...	La Brea	9 x 10^6MT	...	Grades are homogeneous in a "lake" about 37.6 hectares and 100 metres deep at the centre.
GLASS SAND	Found as part of a large system of terraces built up of detritus produced by river erosion of the Northern Range during Pleistocene Times.	Northern Range.	1 x 106 cu.yd. Mathura deposit	2 x 10^6 cu.yd. Mathura deposit	Deposits consists of white fine unconsolidated grains of silica.
OTHER SANDS (Plastering sand)	Surface manifestations over long distances.	Central Trinidad - Arena San Raphael, Longdonville, Claxton Bay.	Unlimited		Homogeneous material consisting of fine grains of silica varying in colour from white to red.
GRAPHITE	Sporadic deposits of material. There are dark seams within the phyllites of the Northern Range.	Northern Range.	...	...	Small size of deposits would preclude commercial exploitation.
GYPSUM	Faulted and slightly displaced segments of a bed of gypsum 20 ft. thick.	i) Area within the Arima—Pilar Fault Zone. ii) Fault-disturbed contact between black-red-purple phyllites and white limestone of the Laventille series of the lower Cretaceous period.	...	...	Segments have been exposed and quarried at intervals. The material is white and very pure with a few specks of elemental sulphur present.

COUNTRY: TRINIDAD AND TOBAGO

TABLE XIII (continued)

MINERAL RESOURCES DATA

MINERAL	INDICATION	OCCURRENCES	RESOURCES		REMARKS
			PROVEN	POTENTIAL	
NON-METALLIC					
LIMESTONE	Widely deposited.	Northern and Central Ranges.	...	...	Northern Range limestone grey to blue in colour nearly pure metamorphosed limestone $\geq$ 90% $CaCO_3$. Central Range limestone yellowish brown and of lower purity.
SAND AND GRAVEL	...	Eastern Trinidad - Wallerfield, Valencia Mathura.	$\geq 6 \times 10^6$ MT	11×10^6 MT	Quality of material varies. Low quality material associated with much clay.
STONE					
Porcellanite	...	Southwest Trinidad Cedros, Erin, Exist also in North East.	Non known	7×10^8 cu.yd.	Varies in quality. High quality 3% SO_3 said suitable for manufacture of pozollanic cement.
Diorite	...	Green Hill, Tobago.	3×10^6 cu.yd.	...	Type and quality varies with degree of weathering and lithology.

Source: No. 9 in List of References and data from CEPAL files.

ANNEX 1

BACKGROUND NOTES ON SELECTED MINERALS

BAUXITE

Bauxite mining is the second most important mining activity in the entire CDCC sub-region, following the extraction of petroleum and natural gas. The six countries in the CDCC region where bauxite is mined are Jamaica, Suriname and Guyana, the three largest producers, and the Dominican Republic, Cuba and Haiti with smaller scale production.

Bauxite in Jamaica[1/]

The bauxite/alumina industry in Jamaica, accounts for about 74% of her export earnings, 30% of government's non-loan revenues and 11% of the Gross Domestic Product in recent years. Production of bauxite commenced in 1952 and to date (1980) some 229 x 10^6 tonnes of bauxite have been mined and 71 x 10^6 tonnes of alumina produced.

The bauxite deposits occur as solution cavity infillings within the members of the White Limestone Formation. The depths of these deposits vary from over 100 ft to only a few inches, but with an average depth of about 20 ft. Deposits under 5 ft. are usually not considered mineable.

The predominant minerals are gibbsite - $Al(OH)_2 3H_2O$; boehmite - $Al_2O_3OH_2$; geothite - FeO_2H; haematite - Fe_2O_3; quartz - SiO_2 and kaolinite - $Al_2Si_2O_5(OH)_2$. Note that the actual distribution of these minerals depend mainly on the geology of the area and there are regional characteristics in the distribution of the ore.

Jamaica ranked fourth during 1979 amongst world producers of bauxite. Ore production reached 12.1 x 10^6 tonnes in 1980, (up from 11.5 x 10^6 tonnes in 1979) but was below the 1974 record of 15.3 x 10^6 tonnes. Approximately 6.1 x 10^6 tonnes of bauxite were processed during 1980 with alumina output at 2.5 x 10^6 tonnes. During 1979 alumina plants operated at approximately 80% of full capacity. Greater efforts are now being made to utilize plant capacity more fully.

1/ For more details see No. 2, 11 and 25 of the List of References.

To date there are no aluminum smelting facilities, the main obstacle being the unavailability of an adequate source of power. Consequently, more than half of the bauxite and all the alumina production are exported. Prospects of further rises in the prices of bauxite and alumina will operate to the advantage of Jamaica, and may make the idea of a fully integrated aluminum industry more feasible.

TABLE 1

Ownership of the Bauxite Industry in Jamaica

NAME	OWNERSHIP		Capacity ('000 tonnes per year)	
			BAUXITE	ALUMINA
1. JAMALCAN	Alcan Aluminum Ltd. Government of Jamaica	93% 7%	2,687	1,100
2. Alumina Partners of Jamaica Ltd.(ALPART)	Anaconda Aluminum Kaiser Aluminum Reynolds Metals	28% 36% 36%	3,117	1,150
3. JAMALCO	Aluminum Company of America Government of Jamaica	94% 6%	1,270	550
4. Kaiser Bauxite	Government of Jamaica Kaiser Aluminum	51% 49%	4,200	-
5. Reynolds Mines Jamaica Ltd.	Government of Jamaica Reynolds Metals	51% 49%	3,100	-
6. (Revere Alumina)	(Revere Copper and Brass)	.....	(500)	(200)
Total (excluding Revere)			14,374	2,800

Source: See No. 2 of the List of References.

In an effort to increase its participation in and knowledge of the industry and also expand existing capacity, the Jamaica Government has established three entities since 1974: Jamaica Bauxite Institute, Jamaica Bauxite Mining Limited, and Alumina Trading Company of Jamaica. During the past two years (1978-80), joint venture agreements involving the partial acquisition of mining lands and operations have been entered into with the bauxite companies. In September 1978, a partnership between the Government of Jamaica and ALCAN - JAMALCAN became effective. The Government, as part of this agreement acquired all of ALCAN's mineral lands (valued at J$7.5 million (1978))that were not retained for mining and alumina refining.

Similar agreements came into effect in 1980. In February 1980, under agreement with Reynolds Metal Company and Reynolds Jamaica Mines Limited, 51% of the mining assets were acquired by the Government of Jamaica through Jamaica Bauxite Mining Limited. An important aspect of this agreement was the acquisition of 100% of the farming assets and all lands, apart from that on which mining facilities are located. A partnership agreement between the Jamaican Government, Kaiser Aluminum and Kaiser Jamaica Bauxite Company, whereby the Government of Jamaica acquired all mining lands and 51% of bauxite mining operations also became effective in 1980. Further negotiations are being conducted for the establishment of other joint venture projects.

In May 1974 the Jamaican Parliament promulaged the Bauxite(Production Levy) Act, which imposed a levy on mined bauxite whether for export or for local processing into alumina. During 1980, approximately J$321m were collected under this levy.

Bauxite in Suriname

In the year 1922, the first shipment of bauxite was made from Suriname and by 1929 the industry became the main area of economic activity. The contribution of the mining sector to GDP in Suriname rose from 27.4% in 1963 to 33% in 1970 but the share has since declined. Bauxite, alumina and aluminum dominate export trade.

There are two types of bauxite deposits in Suriname, namely the coastal type bauxite and the plateau type of bauxite. The former is mainly of sedimentary origin and with deposits running in an approximately east-north-east direction nearly parallel to the entire coastline of Suriname. The bauxite deposit is of high quality, that is, low in iron with an alumina content (Al_2O_3) well above 50%.

The plateau type bauxite is of residuary origin, formed out of residuary clay and occurring as small or larger lenses of alumina-rich material. It has a high iron content and is of lower quality than the coastal type bauxite.

The two main areas where plateau type bauxite is found are:

1) The Adampa-Kabalebo area in the north-west, lying within the sphere of the hydropower potential of the Kabalebo, Lucie, Coeroeni and Upper Corantijn Rivers.

2) The area north-east and within the sphere of the Brokopondo hydro-electric project as well as the hydro-electric potential of the Saramacca, Marowyne, Tapanahony and Lawa Rivers.

Bauxite reserves in Suriname are estimated to amount to between 450 and 600 x 10^6 MT although this figure excludes some unexplored resources.

Production of bauxite amounted to approximately 4.8 x 10^6 MT during 1979, continuing a decline from the levels of the early 1970's when production averaged in excess of 6.7 x 10^6 MT. Production of alumina however, has followed the opposite trend and was approximately 1.3 x 10^6 MT in 1979. Aluminum production which started in 1965 averaged around 5 x 10^4 MT during the decade of the 1970's.

Three companies are presently involved in the bauxite industry in Suriname, two of which have been established in the country for many years - SURALCO which is a fully owned subsidiary of ALCOA and Billiton Maatschappij NV, part of the Royal Dutch Shell Group. It is noteworthy that the refinery and smelter at Paranam, owned by SURALCO, handles bauxite also from Billiton.

The third company, NV Grassalco is state-owned and is presently opening up unexploited deposits of bauxite in the Bakhuis region of Western Suriname. This bauxite would be refined at a new plant to be located at Apoera on the Corantijn River. This scheme is part of a project, funded by the World Bank to develop the western parts of the country by erecting an alumina plant, 2×10^5 to 8×10^5 MT capacity, as well as a hydro-electric facility, 125×10^3 kW capacity.

At the beginning of 1958 a document known as the "Brokopondo Agreement" was signed by representatives of Suriname and SURALCO which included the establishment of a completely integrated aluminum industry and an 80 million kW/h hydropower generating plant at the Brokopondo Dam. The Company agreed in part to spend 10 million guilders in 20 years on a geological survey of a large unexplored area in the eastern part of Suriname.

As of the early to mid-1970's alumina capacity (Chemical-Bayer process) was 1.4×10^5 MT and aluminum production capacity 6×10^4 MT per year. The generally lower level of production has been offset by the considerable increase in world market prices for aluminum in recent years.

The Suriname Government collected its share of the higher prices by agreeing at the end of 1974 with the two mining companies, SURALCO and Billiton, on a new system of taxation: The levy due to the state is now linked with the selling price of aluminum instead of with the volume of ore extracted. It is estimated that about 20% of the ordinary budget revenue is derived from this source.

Bauxite in Guyana

Bauxite, including alumina, is the principal mineral product of Guyana, accounting for around 15% of GDP and about half the country's export earnings in the last few years. Total production of bauxite ore has averaged about 3×10^6 MT and alumina over 0.25×10^6 MT in recent years. Value of exports of bauxite and alumina during 1978 amounted to about G$330 million.

This mineral is presently extracted in three areas. The largest group of mines is situated at Linden on the Demerara River, and the other mines are located at Ituni and Kwakwani.

In one respect bauxite resources of Guyana are of particular significance in that the country is the world's largest producer of calcined bauxite, a pure aluminum ore, containing a low proportion of iron which is used for refractory purposes.

Bauxite deposits are found within a large arcuate belt, stretching from the vicinity of the Pomeroon River (Essequibo County) to the Corentyne River (Berbice County), covering a distance of over 200 miles in length and 8-40 miles in width in a north-west to south-east direction.

Locally, bauxite occurs as large dome-shaped deposits resting horizontally on selective areas of the old land surface which subsequently became submerged and preserved by deposits of white sands and clays of later geological eras.

Detailed estimates of bauxite reserves are available mainly for the Berbice and Demerara deposits, with only rough estimates available for the Essequibo deposits. Measured reserves are given as approximately 150 x 10^6 crude metric tons, however by taking into account large but poorly-explored resources not readily accessible from the existing mining areas, a figure of 1016 x 10^6 MT is suggested.

Organized mining of bauxite in Guyana began in October 1916 following the granting of certain leases of Crown Colony Lands at Christianburg, Wismak and Three Friends, on the Upper Demerara River. The first commercial shipment of crude bauxite (2,069 MT) from Guyana was made by DEMBA 2/ during 1917 from their mine at Three Friends.

In 1934 another foreign company became interested in the deposits in the Kwakwani area (on the Upper Berbice River). By 1939 a washing plant was installed here, and a transhipment plant at Everton near the mouth of the Berbice River.

2/ Demerara Bauxite Company.

There is only one alumina plant in Guyana, to date, which was built by DEMBA (construction beginning in 1956) and commissioned in May 1961 (the long construction period resulting partly from the 1957 recession in the industry). The original installed capacity was given as 304,815 tonnes per year but the plant has a rated capacity presently of 350,000 tonnes per year.

At present there are three companies involved in the extraction of bauxite:

BIDCO - The Bauxite Industry Development Company Limited, which was incorporated in 1976. BIDCO is a state-owned holding company, which, in addition to providing common core services such as marketing and shipping, is responsible for co-ordination and development, including the diversification of the entire bauxite industry in Guyana.

GUYBAU - Guyana Bauxite Company Limited, which is a subsidiary of BIDCO was incorporated in June 1971. It is the largest and the better known of the two operating companies and is located in the area of the Demerara deposits. Formerly this company was known as DEMBA.

BERMINE - The Berbice Mining Enterprise Limited which was incorporated as a state-owned company in 1975 is located in the area of the Berbice deposits and is the smaller of the two operating companies.

Guyana has ambitious plans for the expansion of the bauxite and alumina industry and a number of initiatives during 1978 was related to these plans. In February 1978, BIDCO announced that it had hopes of increasing production and reducing costs by the installation of a $28 million Lurgi fluidised bed calciner. It is expected that this investment would save 30% in fuel and maintenance costs. In May 1978 the USSR offered to undertake a feasibility study for a new 600,000 tonnes per year alumina refinery. In the late 1970's a joint project for smelting alumina involving Guyana, Jamaica and Trinidad and Tobago was studied but the suspended negotiations have not yet been resumed.

Guyana, like other developing countries, needs to increase the value added of production from its natural resources. Since Guyana has large reserves of metallurgical grade bauxite and an existing alumina plant, it is hoped to construct smelter facilities for producing primary aluminum as a first step and ultimately to fabricate intermediate and finished products.

Energy sources for this project would come from the Upper Mazaruni Hydropower Scheme which is in the preliminary stages of implementation.

The Linden area was chosen as the location for the smelting facilities because:[3/]

- alumina facilities are already located there;
- the workforce in the area is accustomed to working and living in an industrial town type atmosphere;
- river conditions would permit transportation of imported input materials and the exportation of metal;
- it facilitates economical location of an electricity substation of the Upper Mazaruni Power Generating facility with respect to the existing national grid system;
- there is ample land available for the aluminum smelter and possible future fabricating facilities;
- there are no major agricultural activities of the sort that may be affected by possible fluoride emissions from the aluminum smelter.

Bauxite in the Dominican Republic

Early geological work in bauxite was done in the Dominican Republic during the 1940's. In 1952, mine construction activities commenced and one company started exporting bauxite in 1959. A pre-feasibility study for an alumina plant was done by a foreign company in 1967. As a result of the general paucity of information on the potential bauxite deposits, another study was proposed to evaluate additional potential of bauxite in the Dominican Republic.

Bauxite is of some importance in the Dominican Republic but the industry is not as vital as in the Case of Guyana, Jamaica or Suriname. Production of bauxite reached a level of nearly 1120 x 10^3 metric tons in 1974 but declined between then and 1979. Volume of exports followed the same trend but export receipts have been increasing since 1977 owing to favourable market conditions.

3/ No. 3 of List of References.

During 1975 government receipts from bauxite amounted to US$11.00 per ton compared with US$3.00 in 1973. The agreement with the multinational enterprise was due for re-negotiation since 1976 but was again postponed to 1980. The outcome is not yet known.

Bauxite deposits are found in the Padernales zone where the geology is comparable with that of the deposits found in Jamaica and Haiti, and in the flanks, south-east of the Sierra de Bahoruco. Elevation of deposits of white to red bauxite varies from 400m to 1,350m. These are related to the deposits of the Plaisance region whose thickness ranges from 600 to 700 metres.

Grey deposits of bauxite are found in the north-west region and are suspected to be the product of chemical erosion of the limestone which resulted in a laterite bed of aluminum oxide of low quality.

The chemical composition of the bauxite in the Dominican Republic, on the average, is as follows:

50.0%	Al_2O_3	2-3% TiO_2
2-10%	SiO_2	Loss by decomposition - 28%
16-20%	Fe_2O_3	

Most of the deposits are found in elongated and circular cavities. The mineral consists fundamentally of two ore types, viz. gibbsite Al_2O_3 $3(H_2O)$ with a proportion of 65.4% Al_2O_3 and 36.4% H_2O and boehmite Al_2O_3 H_2O with 85% Al_2O_3 and 15% H_2O. The monohydrate has the most predominant occurrence.

All of the proven reserves are under concession to the Aluminum Company of America (ALCOA). Apparently conservative estimates at the beginning of 1977 (see Table 2 at the end of this section) put the figure for "measured reserves" at 17 x 10^6 MT. Probable reserves, not yet quantified, are believed to exist in the region Charco de la Paloma, an area north of the area under concession to ALCOA. Also in the eastern region of Samaná, there appears to be small deposits of bauxite. One source 4/ states that total reserves are of the order of 60 x 10^6 MT.

4/ See No. 8 of the List of References.

Bauxite in Haiti[5/]

The bauxite industry is relatively less important to Haiti than to most other CDCC bauxite producing countries. As of the beginning of 1977 recoverable reserves stood at some 5 million metric tons, extraction of bauxite for that year was just over 0.6 million metric tons. Exports provide valuable foreign exchange receipts which amounted to about US$17 million in 1977. Royalty payments during the early 1970's were fixed at US$0.50 per ton of bauxite exported. During 1976 a new contract was signed by the government and the producing company whereby payments to the government would more closely reflect the actual price of aluminum. Income to government rose to approximately US$15.00 per ton.

In 1950 the first mineral (bauxite) agreement was concluded, having terms which included an initial investment, valued at $10 million and a production capacity of 350,000 tonnes per year. In the 1960's the company increased its productive capacity to 750,000 tonnes per year.

In 1963 the Government introduced new rules in the agreement requiring renegotiations of the financial arrangements every three years and the rehabilitation of the mined-out land.

The only well-established bauxite mine in Haiti is owned by Reynold's Haitian Mines S.A. located in the southern peninsula area.

The Government has established an institution called "The National Institute of Mineral Resources" which deals with all the activities related to the mining sector. Haiti is also a member of the International Bauxite Association (IBA) and as such has benefited from actions taken by that body.

5/ Data are not available on the geological aspects nor on prospects for future discoveries.

Since 1974 new field investigations have been conducted by a number of foreign mining interests. However, available data suggest little promise of additional economic occurrences of bauxite. The paucity of data concerning the bauxite industry in Haiti makes the full assessment of its potential difficult.

TABLE 2

RECOVERABLE BAUXITE RESERVES (On Dry Bone Basis)

AND ALUMINA EQUIVALENT AS AT JANUARY 1977

(Mill. tonnes)

COUNTRY	Recoverable Resources			Alumina Equivalent		
	Measured	Possible	Total	Measured	Possible	Total
CUBA	...	...	...	...	...	...
DOMINICAN REPUBLIC	17	...	(17)	7	...	(7)
GUYANA	678	1142	1820	339	509	848
HAITI	5	...	(5)	2	...	(2)
JAMAICA	2134	...	(2134)	918	...	(918)
SURINAME	227	185	412	118	96	214

Source: No. 6 of List of References

TABLE 3

PRODUCTION AND EXPORT OF BAUXITE AND REFINED PRODUCTS

	PRODUCTION FOR SELECTED YEARS ('000 MT)			EXPORT ('000 MT)		
	Bauxite [1/]	Alumina	Aluminium	Bauxite	Alumina	Aluminium
			CUBA			
1971	...	...	...	...	...	...
1973	...	...	...	...	...	...
1975	...	...	...	...	...	...
1977	...	...	...	...	...	...
			DOMINICAN REPUBLIC			
1970	1,086	-	-	1,311.2	-	-
1973	1,145	-	-	1,410.7	-	-
1975	772	-	-	909.9	-	-
1976	621	-	-	617.0	-	-
1977	576	-	-	781.1	-	-
1978	568	-	-	756.7	-	-
1979	524	-	-	634.7	-	-
1980	510	-	-	...	-	-
			GUYANA			
1970	4,418	317	-	...	...	-
1973	3,622	238	-	...	...	-
1975	3,830	299	-	2,196	325	-
1977	3,344[e]	260	-	1,600	263	-
1978	3,450[e]	230	-	1,601	247	-
1979	3,000[e]	...	-	...	...	-
1980	...	...	-	...	...	-

TABLE 3 (continued)

PRODUCTION AND EXPORT OF BAUXITE AND REFINED PRODUCTS

	PRODUCTION FOR SELECTED YEARS ('000 MT)			EXPORT ('000 MT)		
	Bauxite 1/	Alumina	Aluminium	Bauxite	Alumina	Aluminium
			HAITI			
1970	673	...	-	...	...	-
1973	779	...	-	...	...	-
1975	523	...	-	...	...	-
1976	739	...	-	...	...	-
1976	701	...	-	...	...	-
			JAMAICA			
1971	12,543	1,876	-	7,590	1,783	-
1973	13,490	2,506	-	7,389	2,316	-
1975	11,380	2,276	-	5,483	2,375	-
1977	11,434	2,049	-	6,355	2,034	-
1978	11,736	2,115	-	6,488	2,139	-
1979	11,505	2,096	-	6,469	2,061	-
1980	12,053	2,458	-	6,146	2,361	-
			SURINAME			
1971	6,718	1.069	55	3,476	1,149	47
1973	6,976	1,346	54	3,666	1,209	54
1975	4,749	1,130	35	2,324	1,090	26
1976	4,587	1,163	46	1,976	1,060	46
1977	4,856	1,215	50	2,206	1,059	58
1978	5,025	1,316	59	2,284	1,124	55
1979	4,769	1,312	53	1,767	1,329	45

1/ Crude Ore.

Source: 4, 5, 8, 16, 19 and 25 of List of References and data supplied CEPAL

COPPER

Copper in the Dominican Republic [6/]

There exist in the Dominican Republic five different areas in which copper deposits are located. Three of these are considered as economically significant.

(1) The Mata Grande deposits are located on the northern flanks of the Cordillera Central and to the south of the San José de las Matas, where variable zones of five to eight metres of copper oxide exist with a copper content of 0.5%. There are other veins one metre thick with a copper content ranging from 1-3%. The extent of reserves of this deposit is not known.

(2) The Cordillera Central, has been an area under concession by MITSUBISHI. This concession for exploration included the areas Mata Grande, Cañitas, Carmen, Pinar Bonito. The rocks in these areas belong to the Upper Cretaceous period and the mineralization appears close to the contacts of the different intrusive bodies of the Cordillera. Copper content of these deposits range from 2.8% to 11.2% copper.

(3) To the north-east of Jarabacoa, there is a vien of copper ore, whose reserves are unknown. However, the copper content is 8.9% with 1.29% zinc, 2.07 g/MT of gold and 53.8% silver. The real economic potential of this deposit needs to be assessed, although preliminary exploration suggested that reserves were approximately 1 x 10^6MT.

(4) To the north of San Cristobal and near to Río Nigua, are some copper deposits which were exploited on a small scale at the beginning of this century. The copper content and the reserves of these deposits are also not known.

(5) In the Las Cañitas area, geochemical and geophysical studies were done in order to make a superficial evaluation of the extent of mineralization in the area. It was concluded that these deposits had no economic significance.

6/ See No. 8 of the List of References.

The UN Statistical Yearbook shows small quantities of production of copper in the Dominican Republic up to 1970. There is apparently the intention to fully exploit the copper resources once the international market conditions improve. It may be noted here that copper prices have increased significantly during the last two years.

Copper in Haiti [7/]

In 1950 a foreign company obtained a concession from the Haitian Government for copper exploitation, covering 200 km in the area called "Meme" close to Gonaive. From 1960 to 1972, the date on which the mine was closed, approximately 30,000 tonnes of copper concentrate (average 28-30% Cu) were exported. Exploitation of copper resources of an assay of 1.4% Cu proved uneconomic.

The foreign owned company had remitted to the Haitian government a mineral zone of approximately 70 $Km.^2$, with the most up-to-date geochemical characteristics of the area. Extent of mineralization has been estimated, and it has been suggested that a pre-feasibility phase be initiated with bilateral aid from the German Government. In 1976, the Haitian Government signed two mineral agreements granting exploitation rights to foreign companies. The companies have done studies on the geochemical nature of their concession and field work has commenced.

Copper in Cuba

Copper is the nation's second most important metal in terms of production value. Copper ore is extracted form mines located in the Pinar del Rio area but other deposits are known to exist near Cumanayagua, Fomento and Sanchi Spiritus in the Sierra Maestra, and also in the Zapata Peninsula. Extraction of these deposits dates back over 400 years. Associated with the copper deposits are traces of lead, zinc, gold, silver and sulphur.

Currently production is only at 2500 MT per annum. Production should increase once the recently discovered resources are developed.

7/ See No. 18 of the List of References.

TABLE 4

COPPER ORE PRODUCTION 1970-1977

('000 MT - Cu Content)

Year	Cuba	Dom. Rep.	Haiti
1970	0.4	0.4	4.8
1971	...	-	6.6
1972	1.8	-	-
1973	2.1	-	-
1974	2.9	-	-
1975	2.8	-	-
1976	2.9	-	-
1977	6.0	-	-
1978	...	...	...
1979	2.5	...	...

Source: No. 16 of List of References for 1970-1977: No. 5 for 1979.

Copper in other Countries

So far as is known there is no mining of copper in other countries. There are however, several reported occurrences and exploration has been done in some countries.

Several surveys and test drills have been carried out at different sites in Suriname. Samples of blocks of kaolinized granitic rock from the upper Tapanahonys River area contained up to 4.5% Cu, while the turquois bearing laterite from the same area showed maximum 0.8% Cu.

Potential level of reserves have been estimated in Guyana where isolated samples have assayed up to 2% Cu , but generally much lower. Occurrences have been reported in Jamaica at several locations, the one located in Central Jamaica apparently being most important. Small scale copper mining was attempted in Jamaica at several locations during the 19th century. It was reported during 1979 that a study was underway..

NICKEL

Cuba and the Dominican Republic are the two producers of nickeliferous laterite minerals in the CDCC region.

Nickel in Cuba

Cuba's total nickel reserves (among the largest in the world) amounted to about 19 million tons (1972 estimate) of metal contained in ore with average grade ranging from 0.8% to 1.77%. Economically exploitable reserves were estimated at about 3.4 million metric tons (Ni content) and additional resources about 16.0 million metric tons. The deposits which are situated in the Oriente Province in the eastern part of the island, contain on average between 1.5% to 1.7% nickel. These deposits are also an important source of iron, chromium, cobalt and manganese.

Nickel was not exploited in Cuba until 1943 when the Nicaro Nickel Company commenced operations. Production during the 1960's averaged 15,000 MT per year of nickel oxide. Overall nickel production capacity increased in 1969 by the opening of a new extraction plant at Moa Bay in northern Oriente Province. Commercial production of nickel sulphide began in 1962.

Cuba was the world's fifth largest nickel producer in 1976,[8/] with production of 37,000 MT of nickel ore accounting for slightly less than 5% of the world's output in that year. Output for 1979 has been estimated at the same level as in 1976.

During that year productive capacity of the Rene Ramos Latour Complex at Nicaro and the Pedro Soto Alba complex at Moa in the Oriente province was fully utilized. Half of the mineral is produced at Nicaro as granular oxide and nickel oxide sinter. Output from Moa is in the form of nickel oxide plus cobalt sulphur. Mine feed to these operations is at a rate of 4.0 million tonnes/year.

Despite a prolonged period of depressed earnings and surplus inventories experienced by the world nickel industry, Cuba formulated expansion plans during 1978 which were intended to almost triple nickel production by 1985. Cuba's ability to finance this contra-cyclical investment stems from the security of long term nickel sales contracts at favourable prices with COMECON trading partners.

8/ See No. 16 on the List of References.

The first phase of the expansion commenced in 1979 and included rebuilding and modernization of the Nicaro and Moa plants to reach a productive capacity of about 46,500 tonnes of nickel content (oxide-sinter) by 1980.

The second phase[9/] of the expansion plans includes the construction of two new nickel plants, each of which would be capable of producing 30,000 tonnes/year. The first plant is under construction at Punta Gorda, east of Moa, and should be operative by 1981. The second plant is to be constructed at Las Camariocas with foreign assistance and is scheduled to come on stream in 1981. On completion of this second phase, Cuba's production capacity will have increased to 107,000 tonnes/year of nickel concentrates.

The third and final phase of the expansion plans requires the construction of a fifth concentrator and smelter, which will take the productivity capacity of nickel to 150,000 tonnes/year by 1990.

(In March of 1978 an economic and technical co-operation meeting held in Havana recommended that development of Cuban mineral resources be accelerated during the next decade by diversifying the mining base from nickel to include copper, lead, zinc and phosphate rock).

Nickel in the Dominican Republic

In the Dominican Republic the sole company exploiting this resource, Falconbridge Dominicana (FALCONDO), has reported that proven nickel reserves are 52 x 10^6 MT containing 1.58% nickel, and probable reserves 21 x 10^6 MT[10/]. These reserves are found in the Bonao Zone which extends from Sierra Prieta to La Vega and accounts for only 30% of the area under exploration. It has been estimated that the reserves can feed the mine for the next 60 years. Additional reserves are thought to exist in Loma Miranda, Loma Pinar, Sucio, Loma Monte, Cerante and Loma El Magote. (It has been reported [10/] that at the end of 1979 Falconbridge "reserves" were 62.3 x 10^6 MT on a dry basis with a grading of 1.64% Ni. Exploration of the newly opened reserves at Loma Caribe commenced at the end of 1979).

9/ Apparently this second phase of the expansion plans has been postponed to a later date and may not come on stream until 1990. (see Mining Annual Review, 1980 Mining Journal Limited (publishers) London).

10/ See No. 5 of the List of References.

Commercial operations of nickel commenced in 1972. However, production of nickel was held to one third of plant capacity due to the continuing weakness in the world nickel market and excessive producer and consumer inventories. In 1978 FALCONDO operated below designed capacity of 30,000 MT of nickel contained in ferronickel. It had been projected earlier that this mine, when in full operation, would contribute more than $60 million annually to the gross foreign exchange revenue of the country (at existing values)[11/]. There are no indications of current plans for expansion.

TABLE 5

MINE PRODUCTION OF NICKEL IN CDCC COUNTRIES

('000 MT - Ni Content)

Year	Cuba	Dominican Republic
1968	37.3	-
1969	35.4	-
1972	36.8	14.5
1975	37.3	26.9
1976	37.1	24.4
1977	37.0	24.9
1978	34.0^{e}	20.0^{e}
1979	37.0^{e}	24.5^{e}

Source: No. 16 of List of References
1978 and 1979 data from Sources
Nos. 5 and 20 respectively.

NOTE: All of the Dominican Republic's mine production is refined locally but up to 1978 only about one-half of Cuban mine production was refined locally.

11/ With shipments of 54 million pounds and average market price of $2.53/lb. Ni in 1979, gross foreign exchange receipts in 1979 exceeded US$135m.

GOLD

Gold is known to be produced in three CDCC member countries;- the Dominican Republic, Guyana and Suriname. Gold output data for recent years are given in Table 6.

Gold in Suriname

Gold occurs in Suriname in several areas scattered throughout the country. There are a few exposures of primary gold located in the midst of metamorphic basic country rocks mainly of the Precambrian Paramaka Formation near contacts with zones of "bi-mica" granites and quartz diorites. The geological conditions are thought to be similar to conditions found in Demerara, Guyana where gold is found in quartz veins.

Almost all the gold produced in Suriname has been found in alluvial deposits. Many of the placers however, are considered to be water-selected eluvial material covered by overburden near the source area.

Gold exploitation started in Suriname around 1875. The Lawa river gold deposits discovered in 1885 have accounted for about one-half the total gold produced in Suriname. Between 1907-10 maximum levels of production was reached at more than one metric ton per year. Since then, production has declined drastically owing to exhaustion of well-known deposits and the relatively high financial investment required for exploitation. More recently, gold has been recovered mainly by individual prospectors, using labour-intensive methods. It is reported that during the 1970's renewed interest was being shown by mining companies.

Gold in Guyana

Gold recovery in Guyana [12/] is exclusively from alluvial and eluvial deposits, and is now on an upward trend (following a long downward slump) resulting from the escalation of gold prices in the last few years.

12/ See No. 3 of List of References.

Several million ounces of gold have been produced from Guyana's gold fields but by international standards, Guyana is a small gold producer exporting approximately half of her annual gold production. Much of the production resulted from the efforts of thousands of miners (pork-knockers) with their gold pans and hundreds of sluices. In some areas, practically every creek was tested, between 1890 and 1935. In a few instances, dredging was undertaken but with one exception, such operations were short-lived.

Gold is found mainly in areas located in the northern half of the country; only a few occurrences are known in the south. It is noteworthy that hard rock of gold mining has met no success in Guyana, principally because there was only one serious effort to establish a hard rock mine. In this case, the cost of mining escalated because of the lack of facilities for treating the pyritic concentrates locally, and thus, these had to be sent abroad for processing.

Suction dredging in the rivers and larger creeks, has revolutionized small mining operations and in those areas which were incompletely worked before, successful work is presently being done.

The future of underground gold mining will rest on the development of deep-seated deposits, especially those in which both gold and base metals can be extracted together. The Geological Surveys and Mines Department in 1976 had been considering the development of some small alluvial prospects and a few hard rock ores. However, information on this development to date is unavailable.

Gold in the Dominican Republic

Gold deposits in the Dominican Republic are found mainly in the Pueblo Viejo area, located in the eastern flanks of the Cordillera Central. The Pueblo Viejo deposit was formed by the erosion of volcanic rock deposits of the Los Ranchos Formation.

Proven resources of the oxide of the Pueblo Viejo deposit as of May 1976 was 25 x 10^6 MT, with an assay of 4.06 grammes of gold and 25.1 grammes of silver per metric tonne of ore. Under this deposit are located significant sulphide deposits containing gold and silver associated with zinc and copper. The metal content of this deposit is as follows: 3.57 grammes gold and 26.1 grammes of silver per metric tonne with 1.4% zinc and 0.143% copper. However, to date, many problems are associated with the metallurgical processing of this deposit whose proven reserves are 21 x 10^6 metric tonnes.

Other gold deposits of less significance are found in Monte Negro and Mejita Este.

Alluvial gold has been found in Bulla, Moncion and Miches and exploited on a small scale. Reserves of these deposits are not known.

In 1973 the Pueblo Viejo gold/silver mine was constructed with an estimated capacity of 8,000 ton/day of ore (three shift basis) which served to elevate the Dominican Republic to rank amongst the ten largest gold producers in the world.

TABLE 6

PRODUCTION OF GOLD IN SELECTED CDCC COUNTRIES

(Kilograms)

Year	Guyana	Suriname	Dominican Republic
1965	65	195	-
1969	65	74	-
1970	138	36	-
1975	562	4	6,065
1976	525	1	12,874
1977	373	...	10,661
1978	467	...	10,663
1979	342	...	10,979

Source: Nos. 5, 16 and 19 of List of References.

DIAMONDS

Diamonds in Guyana

So far as is known, Guyana is the only CDCC country with commercial scale production of diamonds. Alluvial diamonds were discovered in Guyana during 1887. These diamonds are found distributed within and peripheral to the extensive plateaux of the Pakaraima Mountain block of flat lying sandstones and conglomerates in the west of the country. Over 3 million metric carats have been recovered from alluvial deposits. Peak production was attained in the 1920's - the most outstanding year being 1923 when 214,474 carats were recovered. Since then annual production decreased steadily to less than 80,000 carats during the period 1946-1958 and in 1978 was only 17,000 carats.

Most of the diamonds won in the years prior to 1959 were recovered from alluvial deposits within a belt extending for 18 miles from the foot of the Pakaraima Mountains. Since 1959 activity has shifted to within the Pakaraima Mountains with most of the production coming from the deposits in the beds of the upper reaches of the Mazaruni, Cuyuni, Potaro and Ireng rivers and their tributaries.

The several thousand carats of diamonds discovered annually are all worked by hand methods or suction dredging. In some cases both gold and diamonds are recovered together. The future of the diamond industry in Guyana is encouraging but there is need for more efficient prospecting and orderly exploitation of the available resources.

Diamonds in Suriname

Diamond finds had been reported in Suriname as early as 1880. Since that time up to the beginning of the 1970's it was reported that at least 290 mainly small diamonds have been found. A few diamonds have also been found in other locations. Diamonds have been recovered both from eluvial and alluvial gravels in the Rosebel-Sabanpossie area which is drained by several rivers and creeks.

SALT

Common salt, that is, Sodium Chloride (NaCl) is found in some CDCC countries. Available production are given in the table below.

TABLE 7

SALT PRODUCTION IN SELECTED CDCC COUNTRIES

('000 MT)

Year	Bahamas	Cuba	Dominican Republic
1970	621	89	37
1971	1,213	103	39
1972	807	102	31
1973	1,121	124	30
1974	1.027	138	40
1975	1,232	157	37
1976	1,491	150	40
1977	1,871	...	30

Source: No. 16 of the List of References.

All domestic salt production in Cuba is carried out by solar evaporation of sea water. Rock salt outcrops exist, but have not been found in sufficiently large quantities or in suitable locations to make significant commercial exploitation possible.

Salt deposits in the Dominican Republic are found occurring in Las Salinas and Barahona. The strata of salt are vertical and their purity vary between 90-95% sodium chloride. To the north of these deposits salt is found associated with potassium and magnesium. Reserves (possible and probable) of this deposit are of the order of 243×10^6 short tons.

Judging from production data in the above table, the Bahamas would appear to be the largest producer and exporter of salt in this sub-region. However, data on location, extent of reserves, how much are in the form of deposits, extent of solar evaporations, etc. are unavailable.

Apparently salt is produced in St. Kitts. Salt exports appear in officially published export statistics up to the late 1960's but no data are available subsequently. Solar salt production used to be carried out in Jamaica but apparently there is none currently. There appear to be no substantial deposits of salt in that country.

OTHER MINERALS

The data contained in the Inventory are incomplete in terms of number of specific minerals as well as pertinent mineralogical details. The above six minerals got prominence of space because of their commercial importance, prevalence and/or the availability of information.

There are, however, indications of a number of other minerals, some of which are known to exist in several of the countries of the sub-region. The construction minerals - sand, stone, gravel, limestone and clays are found in most countries.

However, there are different grades which are less prevalent and the content of important minerals varies. For example, silica sand for glass making appears to be found in fewer countries than "common" sand. Metallurgical grade limestone is said to exist in few countries only. Gypsum is extracted in Jamaica where sizeable reserves exist. However, while gypsum is said to exist in other countries, data on the mineralogy were not available.

The presence of iron ore has been confirmed in various countries. Much of it is found in conjunction with other metals. So far most occurrences (according to available data) were regarded as not very promising in light of prices and technology a few years earlier.

The prospects may have improved in some instances. However, available data suggest that less than exhaustive investigations have been done in some countries. In this connection it should be noted that Trinidad and Tobago has recently set up an "iron and steel mill" utilizing imported iron raw material.

Manganese occurrences are reported in all the larger CDCC countries and radio-active minerals occur in four or five countries.

At this stage it appears that there is a need for more thorough, extensive and in-depth investigations. In a few cases, present indications suggest that the stage may already have been reached for pre-feasibility developmental studies.

TABLE 8

PRODUCTION OF SELECTED CRUDE MINERALS, 1980

COMMODITY/COUNTRY	UNITS	PRODUCTION
SAND AND GRAVEL		
Antigua	000 MT	23 (1973)
Bahamas	"	...
Barbados	"	...
Belize	"	334^{e}(1975)
Cuba	"	...
Dominica		
Sand	"	2 (1975)
Gravel, Crushed	"	23 (1975)
Dominican Republic	"	80 (1975)
Grenada	"	...
Guyana	"	...
Haiti	000 m^3	20^{e}(1977)
Jamaica		
Glass sand (Silica)	000 MT	5.5
Sand and Gravel	000 m^3	2,740
Montserrat	000 m^3	14 (1975)
Netherland Antillies	"	...
St. Kitts, Nevis, Anguilla	"	...
St. Lucia	"	...
St. Vincent	000 MT	13 (1975)
Suriname	"	...
Sand	000 MT	203 (1975)
Gravel	000 m^3	25 (1975)
Trinidad and Tobago		
Pitch (sand)	000 m^3	86
Plastering Sand	"	21
Sand and Gravel	"	460

TABLE 8 (continued)

PRODUCTION OF SELECTED CRUDE MINERALS, 1980

COMMODITY/COUNTRY	UNITS	PRODUCTION
SILVER		
Haiti	000 MT	.1 (1977)
Dominican Republic	"	708 (1977)
ASPHALT, NATURAL		
Trinidad	000 MT	29
CLAYS		
Guyana		
Kaolin	...	...
Other	...	...
Haiti	000 MT	43 (1974)
Jamaica	"	140e (1975)
Trinidad		
Clay	000 m^3	104
Suriname	MT	3,500e (1973)
Other Countries	...	...
CHROMIUM, ORE (Cr_2O_3 content)		
Cuba	000 MT	10 (1977)
COPPER ORE (Cu Content)		
Cuba	MT	2,400 (1979)
Dominican Republic	MT	450 (1974)
Haiti	MT	1,400 (1972/73)
DIAMONDS		
Guyana		
Gems	000 carats	12e (1975)
Industrial	"	8e (1975)

TABLE 8 (continued)

PRODUCTION OF SELECTED CRUDE MINERALS, 1980

COMMODITY/COUNTRY	UNITS	PRODUCTION
GYPSUM		
Jamaica	000 MT	95
Cuba	000 MT	91[e]
LIME		
Dominican Republic	MT	...
Jamaica (Industrial)	000 MT	159
Antigua	...	...
Barbados	...	...
Cuba	...	...
Netherland Antilles	...	...
CEMENT, Hydraulic		
Bahamas	000 MT	23[1/] (1977)
Cuba	"	2630[e] (1979)
Dominican Republic	"	582 (1976)
Haiti	"	257 (1977)
Jamaica	"	144
Suriname	"	45 (1977)
Trinidad and Tobago	"	5
COBALT		
Cuba	000 MT	1.7[e] (1979)
MANGANESE		
Cuba	"	27.9 (1968)
Guyana	"	38.4 -"-
PHOSPHATE ROCK (crude)		
Netherland Antilles	"	54 (1976[p])

1/ Factory operated only part year.

TABLE 8 (continued)

PRODUCTION OF SELECTED CRUDE MINERALS, 1980

COMMODITY/COUNTRY	UNITS	PRODUCTION
SALT		
Bahamas	000 MT	1,871 (1977)
Cuba	"	150 (1976)
Dominican Republic	"	30 (1977)
Haiti	"	...
Netherland Antilles	"	400 (1977)
St. Kitts/Nevis	"	...
St. Vincent	"	50 (1975)
STONE		
Antigua (crushed)	000 m^3	45 (1973)
Bahamas		
Aragonite	000 MT	2,069 (1976^P)
Limestone	"	31 (1976^P)
Barbados		...
Belize		
Limestone	000 MT	263 (1975)
Marl	"	38 (1975)
Cuba		...
Dominica		
Pumice and Volcanic Ash	000 MT	106 (1975)
Dominican Republic		
Limestone	000 MT	148 (1975)
Grenada	"	...
Guyana	"	...
Haiti		...
Limestone, crushed 2/	"	191 (1975)
Jamaica		
Limestone	"	2,540 (1975)
Marble	"	0.25
Marl and Rubble (Fill)	000 m^3	3,695

2/ Production data refers to Consumption.

TABLE 8 (continued)

PRODUCTION OF SELECTED CRUDE MINERALS, 1980

COMMODITY/COUNTRY	UNITS	PRODUCTION
STONE (cont'd)		
Montserrat	...	...
Netherland Antilles	...	...
St. Kitts, Nevis, Anguilla	...	...
St. Lucia	...	...
St. Vincent	...	...
Andesite, crushed	000 MT	5,690 (1975)
Suriname	"	50[e] (1973)
Trinidad and Tobago		
Diorite	000 m^3	8
Limestone	"	-
i) Bluestone	"	253
ii) Yellowstone	"	267
Porcellanite	"	75
Andesite	"	3
SULPHUR		
Cuba 3/	000 MT	20[e] (1979)
Netherland Antilles 4/	000 MT	94 (1977)

3/ Production recovered from Pyrites.

4/ Production recovered as a by-product in purification of other minerals.

Sources: Nos. 10 and 11 of the List of References.

TABLE 9

IMPORTS AND EXPORTS OF SELECTED MINERALS AND MINERAL PRODUCTS

(Mill. US dollars)

SITC (R) No.	Description	Imports	Exports
	TRINIDAD AND TOBAGO (1978)		
27	Crude Fertilizer, Minerals, N.E.S.	6.9	0.3
273	Stone, sand, gravel	1.1	neg
274	Sulphur-iron pyrites	neg	...
28	Metalliferous ores, scrap	0.1	0.4
66	Non-metallic mineral mfs. N.E.S.	26.4	1.6
661	Cement etc. Building Products	6.0	neg
662	Clay Construction Materials	1.5	neg
665	Glassware	8.3	1.3
67	Iron and Steel	118.3	1.0
671-672	Pig iron and iron and steel ingots	2.6	neg
68	Non Ferrous metals	8.8	neg
684	Aluminium	4.9	neg
	CUBA (1976)		
27	Crude Fertilizer, Minerals N.E.S.	8.2	...
28	Metalliferous ores, scrap	...	5.6
283	Non-ferrous base metallic ores and concentrates	...	5.6
66	Non-metallic mineral mfs. N.E.S.	...	...
67	Iron and Steel	192.9	...
674	Iron, Steel universal plate, sheet	133.8	...
68	Non-ferrous metals	9.8	...

TABLE 9 (continued)

IMPORTS AND EXPORTS OF SELECTED MINERALS AND MINERAL PRODUCTS

(Mill. US dollars)

SITC (R) No.	Description	Imports	Exports
	HAITI 1/		
27	Crude Fertilizer , Minerals N.E.S.	1.0	...
271	Natural Fertilizers	...	...
276	Other crude minerals	0.7	...
28	Metalliferous ores, scrap	...	17.4
283	Non-ferrous base metallic ores	...	17.3
66	Non-metallic mineral mfs. N.E.S.	3.4	3.2
661	Cement, etc. building products	0.3	3.2
665	Glassware	1.2	...
67	Iron and Steel	5.9	...
68	Non-ferrous metals	1.0	...
	BAHAMAS 1/		
27	Crude Fertilizers and minerals N.E.S.	0.6	8.2
276-32	Crude Salt	neg	6.6
276-71	Aragonite	...	5.5
28	Metalliferrous ores, scrap	neg	o.1
66	Non-metallic mineral mfs N.E.S.	5.6	1.0
661	Cement etc. building products	1.0	1.0
663	Clay construction materials	1.2	...
665	Glassware	1.6	...
67	Iron and Steel	2.3	2.2
672	Iron and Steel ingots	0.5	...
68	Non-ferrous metals	0.6	...
684	Aluminium	0.4	...

TABLE 9 (continued)

IMPORTS AND EXPORTS OF SELECTED MINERALS
AND MINERAL PRODUCTS
(Mill. US dollars)

SITC (R) No.	Description	Imports	Exports
	GUYANA (1978)		
27	Crude Fertilizers, Minerals, etc.	1.7	...
273	Stone, sand and gravel	0.9	...
276-39-000	Other common salt	0.5	...
28	Metalliferrous ores, scrap	...	98.2
2833	Bauxite, etc.	...	79.1
66	Non-metallic mineral mfs. N.E.S.	10.1	1.0
661	Cement etc. building products	2.6	...
665	Glassware	4.2	...
667-21	Diamonds, excl. industrial	...	0.6
67	Iron and Steel	8.1	0.1
68	Non-ferrous metals	1.5	...
	JAMAICA(1978)		
27	Crude Fertilizers and minerals, etc.	...	...
273	Gypsum and Limestone	...	...
28	Metalliferrous ores, scrap	...	146.1
283	Non-ferrous base metals, ore, etc.[2/]	...	145.6
66	Non-metal minerals mfs. N.E.S.	16.6	0.6
662	Clay refractory building products	2.1	...
665	Glassware	8.9	...
67	Iron and Steel	26.3	4.0
672	Iron and Steel primary forms	1.0	...
673	Iron and Steel shapes	4.2	...
674	Iron and steel, universal plate, sheet	10.8	3.3
68	Non-ferrous metals	21.5	...
684	Aluminium	8.4	...

TABLE 9 (continued)

IMPORTS AND EXPORTS OF SELECTED MINERALS AND MINERAL PRODUCTS

(Mill. US dollars)

SITC (R) No.	Description	Imports	Exports
	BARBADOS (1978)		
27	Crude fertilizer, minerals N.E.S.	...	...
28	Ores and metal scrap	...	...
66	Non-metallic mineral mfs. N.E.S.	10.7	1.4
661	Cement etc., building products	2.7	...
665	Glassware	4.1	...
67	Iron and Steel	6.8	...
68	Non-ferrous metals	3.2	...
684	Aluminium	2.4	...
	DOMINICAN REPUBLIC (1979)		
27	Crude Fertilizer, minerals, N.E.S.	1.5	2.3
273	Stone, sand and gravel	...	2.2
28	Metalliferrous ores, scrap	...	21.4
283	Non-ferrous base metallic ores, etc.	...	20.9
66	Non-metallic mineral mfs. N.E.S.	14.5	...
661	Cement etc., building products	0.5	...
662	Clay, refractory building products	4.0	...
665	Glassware	4.8	...
67	Iron and steel	38.8	123.5
671	Pig iron and iron and steel ingots	...	123.1
672	Iron and steel, primary forms	3.5	...
68	Non-ferrous metals	12.2	...
684	Aluminium	6.2	...

TABLE 9 (continued)

IMPORTS AND EXPORTS OF SELECTED MINERALS
AND MINERAL PRODUCTS
(Mill. US dollars)

SITC (R) No.	Description	Imports	Exports
	SURINAME (1974)		
27	Crude fertilizers and minerals N.E.S.	1.3	...
273	Sand, stone and gravel	0.8	...
276	Other crude minerals	0.5	...
28	Metalliferrous ores and scrap	...	69.8
283	Non-ferrous base metal ores etc.	...	69.8 2/
66	Non-metallic mineral mfs N.E.S.	6.7	...
661	Lime, cement and other building	1.5	...
662	Clay construction materials	0.8	...
665	Glassware	1.7	...
67	Iron and Steel	8.6	...
673	Iron and steel shapes	3.1	...
674	Iron and steel universal plates etc.	2.4	...
68	Non-ferrous metals	1.5	38.2
684	Aluminium	0.6	38.2

1/ Exports include re-exports

2/ Mainly bauxite.

Sources: Nos. 12, 13,14 and 15 of the List of References.

ANNEX II

CHEMICAL TERMS AND SYMBOLS

ELEMENTS

Al	-	Aluminum	Mo	-	Molybdenum
Ba	-	Barium	Ni	-	Niobium
Be	-	Beryllium	N	-	Nitrogen
Ca	-	Calcium	O	-	Oxygen
C	-	Carbon	P	-	Phosphorous
Cr	-	Chromium	K	-	Potassium
Co	-	Cobalt	Ra	-	Radium
Cu	-	Copper	Si	-	Silicon
Au	-	Gold	Ag	-	Silver
Ce	-	Cerium	S	-	Sulphur
H	-	Hydrogen	Na	-	Sodium
Fe	-	Iron	Ta	-	Tantalum
Pb	-	Lead	Sn	-	Tin
Li	-	Lithium	Th	-	Thorium
Mg	-	Magnesium	Ti	-	Titanium
Mn	-	Manganese	U	-	Uranium
Hg	-	Mercury	Zn	-	Zinc
			Zr	-	Zirconium

Azurite	- Copper Carbonate ore - $CuCO_3Cu(OH)_2$
Agate	- Semi-precious silica mineral
Antigonite	- Magnesium Silicate ore - $MgSiO_2(OH)_4$
Ambylgonite	- Lithium Aluminum Phosphate - $Li(AlF)PO_4$
Barite	- Barium Sulphate - $BaSO_4$
Beryl	- Silicate containing Beryllium and Aluminum $Be_3Al_2(SiO_3)_6$
Boehmite Aluminum Ore	- AlO.OH
Chalcopyrite	- Copper Iron Sulphide Ore - $CuFeS_2$
Cinnabar	- Mercury Sulphide Ore - HgS
Columbite	- Iron and Chromium Ore - $FeCr_2O$
Columbite	- Iron and Columbium Ore - $Fe(CbO_3)_2$
Chromite	- Ore containing Iron and Chromium - $FeCr_2O_4$
Chlorite	- Silicate Complex
Dickite	- Rare form of Kaolinite
Epidite	- Calcium Silicate containing Aluminum, Iron or Magnesium
Euxenite	- Brownish-black mineral containing yttrium, columbium, uranium, titanium, erbium and cerium
Gypsum	- Calcium Sulphate - $CaSO_4$
Haematite	- Iron Oxide - Fe_2O_3
Ilminite	- Iron - Titanium Ore
Kaolinite	- Group of clay minerals containing hydrous aluminum silicates
Magnesia	- Magnesium Oxide - MgO
Magnesite	- Magnesium Carbonate - $MgCO_3$
Magnetite	- Iron Oxide - Fe_3O_4
Monazite	- Thorium-Uranium-Cerium-Phosphate Ore
Molybdenite	- Molybdenum - Sulphur Ore - MoS_2
Malachite	- Basic Copper Carbonate - $CuCO_3Cu(OH)_2$
Quartz	- Pure silica - SiO_2
Scheelite	- Calcium - Tungsten Oxide - $CaWO_4$
Topaz	- Aluminum Silicate - $Al_2SiO_4F_2$
Tantalite	- Iron, Magnesium, Niobium Tantalum Oxide $(Fe/Mn)(Nb/Ta)_2O_6$
Zircon	- Silicate containing Zirconium - $ZrSiO_4$

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